

PROGRESS REPORT

WATER RESOURCE INVENTORY AND ASSESSMENT
ARCTIC NATIONAL WILDLIFE REFUGE

1988 Stream Discharge Gaging Data

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April 1989

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PROGRESS REPORT
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Introduction

This progress report is intended to provide an accounting of the accomplishments made during the first year of a multi-year water resource inventory in the 1002 area of the Arctic National Wildlife Refuge. It is also intended to extend the available stream discharge and water temperature data to resource specialists for consideration in other inventory or management activities. This data represents the hydrologic conditions for only one point in time. Thus, it is premature to attempt any hydrologic analysis or comparisons. Additional years of data collection are required before any characterization of the hydrologic regime is appropriate.

The 1002 area of the Arctic National Wildlife Refuge is located in a remote area of Alaska adjacent to the Beaufort Sea. Because of its remoteness, logistical problems, small populace of the area, harsh climatic characteristics, and lack of competitive water uses in the past, there has been little interest by either state or federal agencies to measure the water yield and flood frequencies in the 1002 area (Appendix A). The nearest stream gaging station (US Geological Survey gage #15908000, Sagavanirktok River) is located 80 miles west of the Canning River. Because the Sagavanirktok River is larger than any river within the 1002 area, the data base for this river can not be extrapolated to streams and rivers in the 1002 area for water availability and flood characteristics.

Childers, et al. (1977) reported the only hydrologic data for the 1002 area. The data reported was a reconnaissance level investigation of the rivers, springs, aufeis fields, and lakes of the north slope, including the 1002 area. The data reported by Childers includes channel characteristics, watershed basin characteristics and estimated flood characteristics of the Canning River, Marsh Creek, Sadlerochit River, Hulahula River, Jago River, and Okerokovik River. Childers also reported discharge rates and selected water quality parameters for the Katakturuk River Spring, Sadlerochit Spring, Hulahula River Spring, and Okerokovik River Spring. Six lakes were sampled for water quality and some data for ice thickness and total lake depth were reported.

With the potential for oil and gas exploration and development in the 1002 area of the Arctic National Wildlife Refuge, an inventory and assessment of water resources is needed for refuge streams. The objectives of this years activities was to initiate a program to quantify the water yield and seasonal stream discharge of the watersheds making up the 1002 area of the Arctic National Wildlife Refuge. A secondary objective was to measure surface water temperatures at stream discharge gaging sites.

Methods

The Water Resources Branch initiated a stream gaging network, consisting of 8 stream gaging stations in the 1002 area in 1988 (Figure 1). Stream discharge data was collected at four sites on the Tamayariak River and one site each on the Akutoktak River, Itkilyariak Creek, Sadlerochit River, and Sadlerochit Spring Creek. Because the Tamayariak River is hydrologically diverse and has abundant fish and wildlife resources, four stream gages were installed on this watershed.

The parameters measured at each gaging site were water depth and water temperature, except for the Akutoktak River where only water depth was measured. Water depth and water temperature were measured at 15 minute intervals utilizing submerged pressure and temperature probes attached to a computerized field recorder. Water depth was measured to the nearest 0.01 foot and temperature to the nearest 0.1 degree centigrade. The field recorder summarizes this data automatically at the end of each 24 hour period into a report and provides the 24 hour average depth, maximum depth, time of maximum depth, minimum depth, time of minimum depth, 24 hour average temperature, maximum temperature, time of maximum temperature, minimum temperature, and time of minimum temperature. This report is stored in a computer chip which can later be down loaded onto a computer.

Throughout the data collection period, biweekly visits to each site were made to collect calibration data. Calibration data included stream discharge and water surface elevation. Through a log-log correlation analysis of stream depth (x) and stream discharge (y), correlation equations were obtained for each stream gage. More than one equation usually exists for each gaging site. As water depth changes the hydraulic radius changes, and a different equation is required to represent the relationship between water depth and stream discharge. Using the correlation equations developed, water depth data recorded by the stream gages was converted to stream discharge. The calibration data were collected using standard stream discharge measurement procedures (Buchanan and Somers 1969, Lyons 1988).

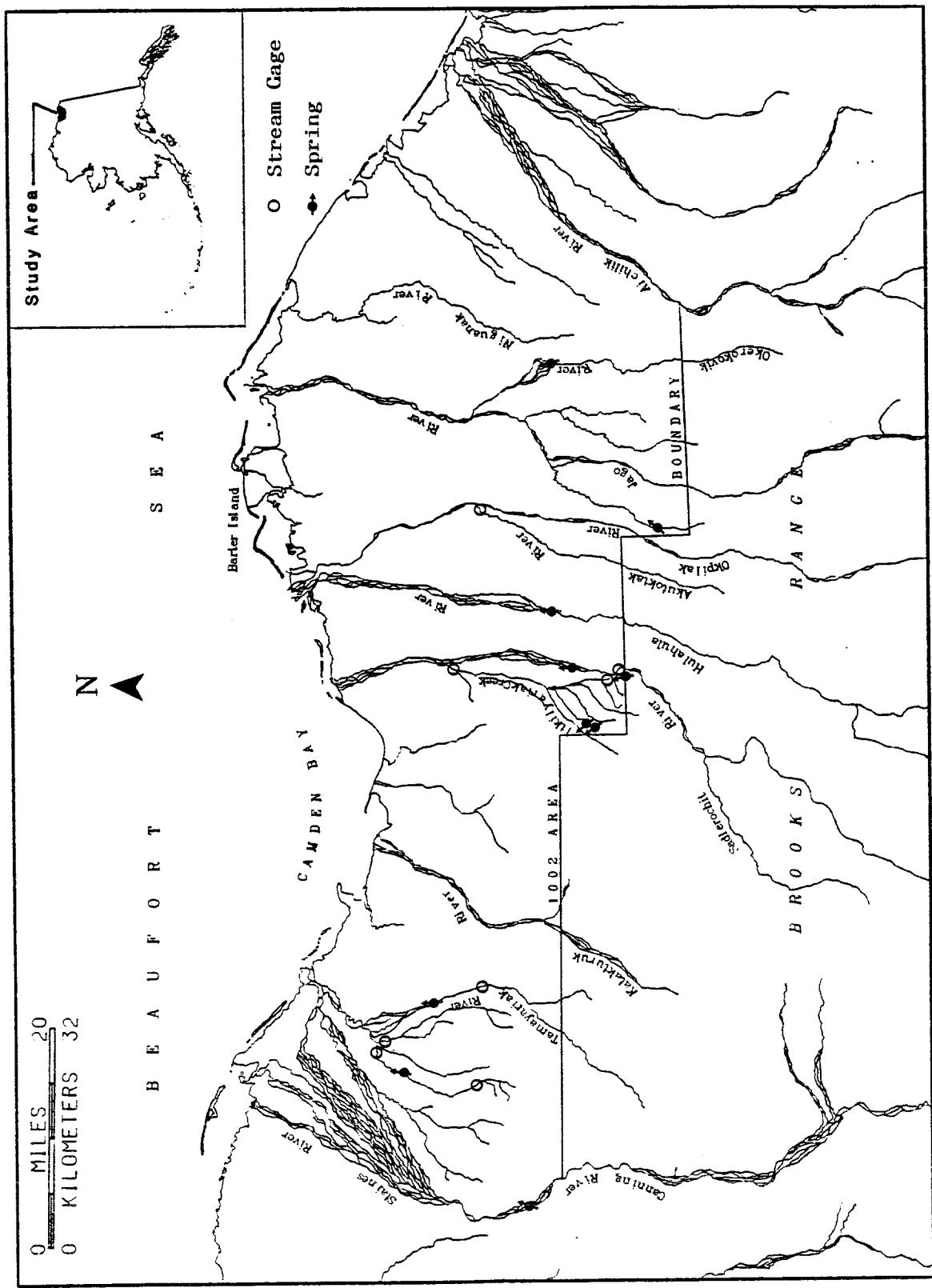


Figure 1.--The 1002 area of the Arctic National Wildlife Refuge with stream gage locations and known springs.

Results

All stream gaging stations were operating by July 20, 1988 and were in service until September 27 or 28, 1988. The only exception is the Sadlerochit Spring Creek gage, which was left to operate throughout the winter. A problem with a loose connector on the Sadlerochit River stream gage resulted in the loss of data from July 28, 1988 through August 15, 1988. A similar problem occurred at the Tamayariak River gage in August. It appeared that an animal pulled or tripped over the cable that connects the probe with the recorder. This resulted in the loss of the temperature data for August 11 and 12, 1988.

For the seven streams where depth data was retrieved, stream discharge was highly correlated with water depth (Table 1). Correlation coefficients (r^2) ranged from 0.966 to 0.999.

Appendix B displays the stream discharges obtained for the 1988 field season, except for Sadlerochit Spring Creek. The daily average discharge, time of maximum discharge, maximum discharge, time of minimum discharge, and minimum discharge for each day is listed for each gage. Also listed is the monthly average discharge, monthly maximum discharge, and monthly minimum discharge.

Appendix C lists the temperature data for each site except Sadlerochit Spring Creek and Akutoktak River. This data includes daily average temperature, time of maximum temperature, maximum discharge, time of minimum temperature, and minimum temperature.

Discussion

Fiscal Year 1988 was the first year of a multi-year water resource inventory program designed to quantify stream discharge rates, discharge frequency distribution, average monthly water yields, and flood frequencies and sizes within the 1002 area of the Arctic National Wildlife Refuge. During spring breakup some problems were encountered in the placement of the water pressure probe used to measure water depth. Concrete anchors were designed to allow for the placement of the pressure probes during the high spring breakup flows of future years.

The stream gaging station which was planned for the Canning River was not installed because the collection of the calibration data from an inflatable boat was not considered to be safe. The installation of a stream gage in the Canning River will require a permanent cableway with cable car.

Table 1.--Stream gage locations and correlation equations for converting stream depth (X) to stream discharge (Y).

Watershed	Gage Location	Correlation	
		Equation	r^2
Akutoktak River	Center sec. 36, T.6N., R.33E.	$y=0.791e2.418x$	0.993
Itkilyariak Creek	SE1/4NW1/4 sec. 15, T.6N., R.31E.	$y=0.965e1.783x$	0.999
Sadlerochit River	NW1/4SW1/4 sec. 31, T.4N., R.32E.	($x \geq 2.2$ ft); $y=43.25e1.04x$ ($x < 2.2$ ft); $y=10.32e1.66x$	0.998 0.993
Sadlerochit Spring Creek	NE1/4NW1/4 sec. 36, T.4N., R.31E.	data not given, still operating	
Tamayariak River	SW1/4NE1/4 sec. 35, T.6N., R.26E.	($x > 1.05$ ft); $y=27.25e1.26x$ ($x \leq 1.05$ ft); $y=0.090e6.68x$	0.982 0.974
Tamayariak River, Lower West Fork	NW1/4NW1/4 sec. 12, T.7N., R.25E.	($x > 1.93$ ft); $y=5.94e1.46x$ ($x \leq 1.93$ ft); $y=0.90e2.44x$	0.998 0.985
Tamayariak River, Middle Fork	Center sec. 12, T.7N., R.25E.	($x > 2.81$ ft); $y=0.39e1.49x$ ($x \leq 2.81$ ft); $y=0.0000000007e8.638x$	0.999 0.996
Tamayariak River, Upper West Fork	W1/2W1/2 sec. 33, T.6N., R.25E.	($x \geq 1.76$ ft); $y=0.82e2x$ ($x < 1.76$ ft); $y=0.001e5.76x$	0.995 0.966

The purpose of the stream gage on the Itkilyariak Creek was to quantify the discharge from the melting aufeis field located in the lower Sadlerochit Spring Creek. However, a suitable gaging site could not be located immediately below the aufeis field. The gaging site used in 1988 is too far downstream to meet the purpose of the gaging effort. This gage will not be installed in 1989 and the equipment moved to an unnamed tributary 2.4 miles upstream from the Itkilyariak Creek gaging site. The new proposed gaging site is located in the NW1/4SE1/4 sec. 28, T.6N., R.31E.

Statistical or hydrologic analysis of this data can not be conducted until a minimum of five years of data is contained in the data base. The past year (1988) was a good example of why a five year data base is necessary to develop a hydrologic description of the 1002 area. The climate from January through July 1988 was significantly drier and slightly warmer than the previous 38 years of record for Barter Island (University of Alaska-Fairbanks 1986, National Oceanic and Atmospheric Administration 1988). Precipitation during this period of time was 57 percent below normal. August 1988 was a very wet month compared to the 38 year average, with precipitation 66 percent above normal. September was again below normal, receiving only 55 percent of the long term average. From January 1988 through September 1988, precipitation was 76 percent below normal. However, if these watersheds are primarily groundwater fed systems, the local climatic conditions may not have a significant effect on the annual water yield. Several years of data are necessary to make such determinations.

References

- Buchanan, T.J., and W.P. Somers. 1969. Discharge measurements at gaging stations. U.S. Geological Survey Techniques Water-Resources Investigation of the United States Geological Survey, Book 8, Chapter A8, Washington D.C.
- Childers, J.M., C.E. Sloan, J.P. Meckel, and J.W. Nauman. 1977. Hydrologic reconnaissance of the eastern north slope, Alaska. U.S. Geological Survey Open-File Report 77-492, Anchorage, Alaska.
- Lyons, S.M. 1988. Stream Discharge Measurement Handbook. U.S. Fish and Wildlife Service, Region 7, Anchorage, Alaska.
- National Oceanic and Atmospheric Administration. 1988. Local climatological data monthly summary, Barter Island, Alaska. U.S. Department of Commerce, Asheville, North Carolina.
- University of Alaska-Fairbanks. 1986. Alaska climate summaries. Alaska Climate Center Technical Note No. 3. Arctic Environmental Information and Data Center, Anchorage, Alaska.

APPENDIX A

Glossary of Hydrologic Terms

Glossary of Hydrologic Terms

Auf'eis: An ice feature that is formed by water overflowing onto a surface, such as river ice or gravel deposits, and freezing, with subsequent layers created by water overflowing onto the ice surface itself and freezing.

Discharge rate: The rate of flow, or volume of water flowing in a given stream at a given place and within a given period of time, expressed as cubic feet per second.

Discharge regime: The discharge pattern over a period of time.

Flood frequency: The probable frequency of recurrence of a flood event, expressed as the 10-year flood, 25-year flood, 100-year flood, etc.

Flood magnitude: The peak discharge of specified flood frequency.

Hydraulic radius: The ratio of the water cross-sectional area to the wetted perimeter.

Water yield: The total outflow of water from a watershed, expressed in units of acre-feet or gallons.

APPENDIX B

Surface water discharge records

ARCTIC NATIONAL WILDLIFE REFUGE

Akutoktak River

Location: Lat $60^{\circ}49'58''$, Long $143^{\circ}46'50''$, in center sec. 36, T.6N., R.33E., 0.6 miles upstream from the confluence with the Okpilak River, 20.8 miles south-southwest of Kaktovik, Alaska.

Drainage Area: 97.1 mi², of which 66.0 mi² is located within the Arctic National Wildlife Refuge Wilderness Area.

Remarks: This is a 4th Order drainage. Discharge records are initiated during break-up and discontinued at freeze-up of each year.

Extremes: Maximum Discharge, 118.9 cfs Aug. 23, 1988; Minimum Discharge, 4.7 cfs Sept. 25, 1988.

JULY 1988

DATE	AVE.DAILY DISCH. CU.FT/SEC	TIME	MAX DISCH. CU.FT/SEC	TIME	MIN DISCH. CU.FT/SEC
		OF MAX		OF MIN	
1	- - -	- - -	- - -	- - -	- - -
2	- - -	- - -	- - -	- - -	- - -
3	- - -	- - -	- - -	- - -	- - -
4	- - -	- - -	- - -	- - -	- - -
5	- - -	- - -	- - -	- - -	- - -
6	- - -	- - -	- - -	- - -	- - -
7	- - -	- - -	- - -	- - -	- - -
8	- - -	- - -	- - -	- - -	- - -
9	- - -	- - -	- - -	- - -	- - -
10	- - -	- - -	- - -	- - -	- - -
11	- - -	- - -	- - -	- - -	- - -
12	- - -	- - -	- - -	- - -	- - -
13	- - -	- - -	- - -	- - -	- - -
14	- - -	- - -	- - -	- - -	- - -
15	- - -	- - -	- - -	- - -	- - -
16	- - -	- - -	- - -	- - -	- - -
17	- - -	- - -	- - -	- - -	- - -
18	- - -	- - -	- - -	- - -	- - -
19	- - -	- - -	- - -	- - -	- - -
20	8	615	8.7	45	7.4
21	8	900	8.7	2215	7.4
22	8	900	8.3	2230	7.0
23	8	845	8.5	0	7.2
24	8	845	8.9	0	7.8
25	8	545	9.2	2045	7.4
26	8	600	8.5	2315	6.6
27	7	515	7.8	2230	6.5
28	7	545	7.4	2245	6.1
29	6	545	7.0	2245	5.8
30	6	615	6.6	1830	5.6
31	6	815	7.0	2230	5.6
TOTAL	88				
AVERAGE	7		8.1		6.7
MAXIMUM	8		9.2		7.8
MINIMUM	6		6.6		5.6
ACRE FT	174				

ARCTIC NATIONAL WILDLIFE REFUGE

Akutoktak River

AUGUST 1988

DATE	AVE.DAILY	TIME	MAX	TIME	MIN
	DISCH. CU.FT/SEC	OF MAX	DISCH. CU.FT/SEC	OF MIN	DISCH. CU.FT/SEC
1	6	715	6.3	2215	5.2
2	5	715	5.9	2045	5.0
3	6	2315	7.8	400	5.0
4	8	700	8.9	2200	7.0
5	7	615	8.3	2130	6.6
6	7	615	7.6	2145	6.3
7	6	645	7.2	2000	5.8
8	8	2345	9.4	0	7.0
9	31	1500	66.1	0	9.4
10	65	945	72.4	2330	55.0
11	43	0	55.0	2345	32.0
12	29	800	32.0	1545	25.8
13	28	915	32.8	2200	24.0
14	22	730	25.2	2345	17.9
15	16	700	17.9	2345	14.3
16	13	715	14.3	2130	11.6
17	18	1115	20.2	0	12.5
18	18	1015	19.7	2015	16.2
19	17	1130	17.9	2100	15.8
20	18	830	20.2	0	16.6
21	23	2345	44.6	0	17.9
22	63	2345	92.9	0	44.6
23	111	830	118.9	0	95.1
24	104	830	111.2	2345	88.8
25	76	0	88.8	2345	63.1
26	55	0	63.1	2345	46.7
27	46	1430	47.8	2345	43.6
28	43	915	43.6	2345	39.7
29	39	945	39.7	1715	37.8
30	46	1330	52.5	0	38.7
31	47	1115	50.1	2330	40.6
TOTAL	1,023				
AVERAGE	33		39.0		27.6
MAXIMUM	111		118.9		95.1
MINIMUM	5		5.9		5.0
ACRE FT	2,029				

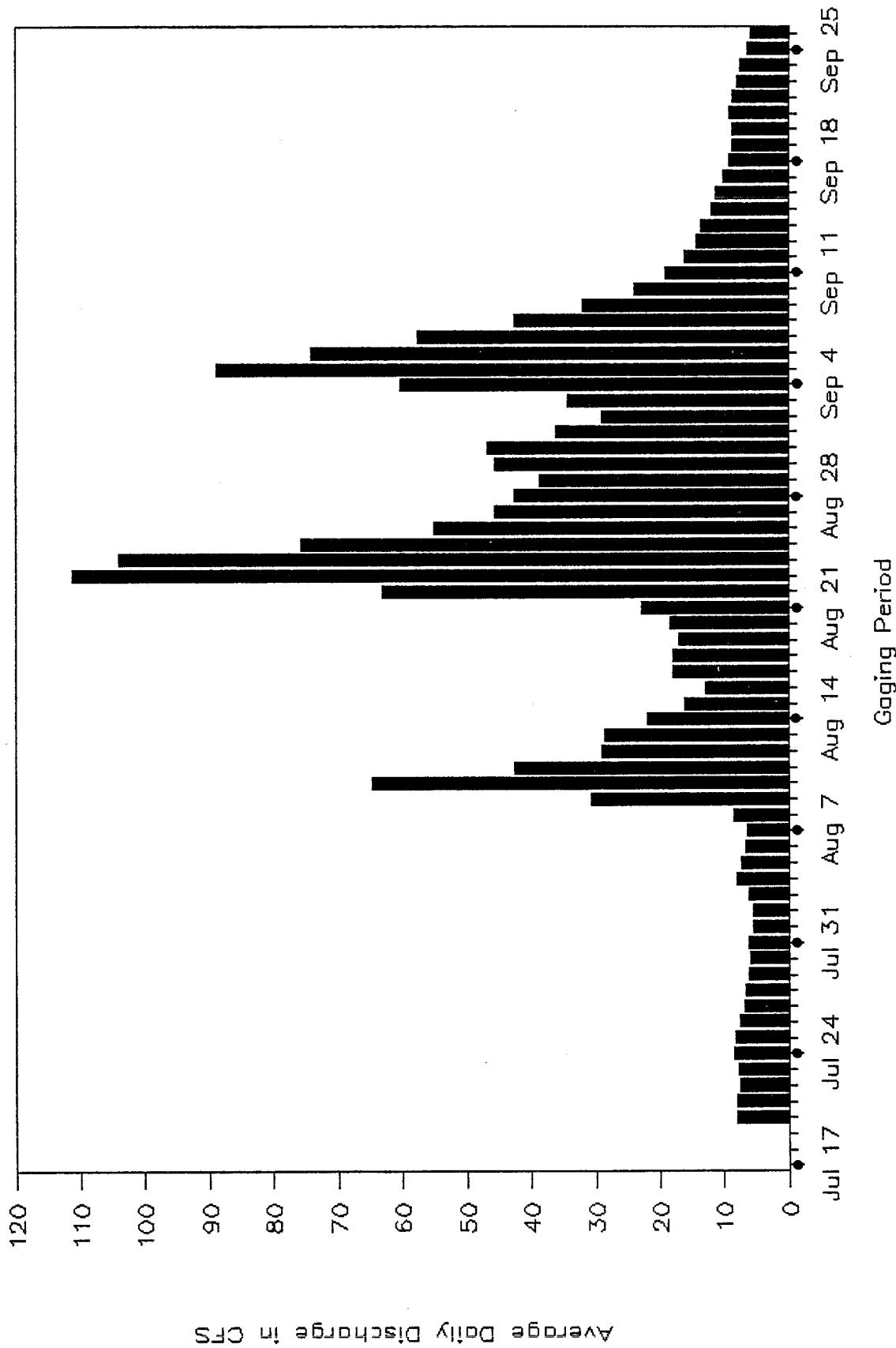
ARCTIC NATIONAL WILDLIFE REFUGE

Akutoktak River

September 1988

DATE	AVE.DAILY DISCH.	TIME OF MAX	MAX DISCH.	TIME OF MIN	MIN DISCH.
	CU.FT/SEC		CU.FT/SEC		CU.FT/SEC
1	36	0	40.6	2330	29.8
2	29	1030	32.0	2345	23.4
3	34	1245	43.6	45	23.4
4	60	2345	74.1	0	37.8
5	89	930	95.1	0	74.1
6	74	30	81.1	2345	66.1
7	58	0	64.6	2330	49.0
8	43	0	49.0	2345	36.1
9	32	0	36.1	2345	27.1
10	24	0	26.4	2345	21.2
11	19	0	21.2	2330	17.4
12	16	0	17.4	2345	15.0
13	14	945	15.0	2345	13.5
14	14	1030	16.2	2345	11.3
15	12	1500	13.5	615	11.0
16	11	1545	11.9	645	10.7
17	10	0	11.0	1945	9.7
18	9	1200	9.7	1745	8.7
19	9	945	9.2	2145	8.3
20	9	1145	9.2	15	8.3
21	9	1300	9.9	2045	8.7
22	9	1000	9.9	1915	8.3
23	8	1230	8.9	1845	7.6
24	8	800	11.6	430	5.3
25	6	1115	10.2	645	4.7
26	6	1230	8.9	600	4.9
27	- - -	- - -	- - -	- - -	- - -
28	- - -	- - -	- - -	- - -	- - -
29	- - -	- - -	- - -	- - -	- - -
30	- - -	- - -	- - -	- - -	- - -
31	- - -	- - -	- - -	- - -	- - -
TOTAL	648				
AVERAGE	25		28.3		20.8
MAXIMUM	89		95.1		74.1
MINIMUM	6		8.9		4.7
ACRE FT	1,286				

Akutoktak River Gaging Station
1988



ARCTIC NATIONAL WILDLIFE REFUGE

Itkilyariak Creek

Location: Lat $69^{\circ} 52' 35''$, Long $144^{\circ} 22'$, in SE1/4NW1/4 sec. 15, T.6N., R.31E., 6 miles upstream from the confluence with the Sadlerochit River, 24 miles southwest of Kaktovik, Alaska.

Drainage Area: 120.4 mi², of which 39 mi² is located within the Arctic National Wildlife Refuge Wilderness Area.

Remarks: This is a 5th Order drainage. Discharge records are initiated during break-up and discontinued at freeze-up of each year.

Extremes: Maximum Discharge, 422.1 cfs Sept. 5, 1988; Minimum Discharge, 50.6 cfs Sept. 25, 1988.

JULY 1988

DATE	AVE.DAILY DISCH. CU.FT/SEC	TIME	MAX DISCH. CU.FT/SEC	TIME	MIN DISCH. CU.FT/SEC
		OF MAX		OF MIN	
1	- - -	- - -	- - -	- - -	- - -
2	- - -	- - -	- - -	- - -	- - -
3	- - -	- - -	- - -	- - +	- - -
4	- - -	- - -	- - -	- - -	- - -
5	- - -	- - -	- - -	- - -	- - -
6	- - -	- - -	- - -	- - -	- - -
7	- - -	- - -	- - -	- - -	- - -
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17	- - -	- - -	- - -	- - -	- - -
18	- - -	- - -	- - -	- - -	- - -
19	- - -	- - -	- - -	- - -	- - -
20	79	0	103.2	1245	68.5
21	66	15	80.4	2030	59.4
22	60	2345	74.8	1745	57.3
23	72	2215	92.7	1600	59.4
24	70	0	91.1	1815	63.8
25	74	2300	89.5	1415	63.8
26	71	2345	105.0	1515	59.4
27	78	100	108.8	1500	61.5
28	71	15	86.3	1430	60.4
29	65	0	83.3	1715	56.3
30	68	2130	58.3	1315	58.3
31	83	2300	114.8	945	68.5
TOTAL	857				
AVERAGE	71		90.7		61.4
MAXIMUM	83		114.8		68.5
MINIMUM	60		58.3		56.3
ACRE FT	1,700				

ARCTIC NATIONAL WILDLIFE REFUGE

Itkilyariak Creek

AUGUST 1988

DATE	AVE.DAILY DISCH. CU.FT/SEC	TIME OF MAX	MAX DISCH. CU.FT/SEC	TIME OF MIN	MIN DISCH. CU.FT/SEC
1	98	0	112.8	945	81.8
2	88	0	94.4	900	79.0
3	100	1330	116.9	115	87.9
4	88	45	97.8	1145	83.3
5	75	0	87.9	1545	67.3
6	74	30	87.9	1430	67.3
7	70	2345	83.3	1630	66.1
8	111	2300	134.8	0	84.8
9	142	2345	150.0	300	134.8
10	145	115	155.5	1830	132.4
11	119	15	142.2	830	110.8
12	150	1930	182.6	45	123.3
13	147	0	170.0	1630	134.8
14	121	15	137.2	1545	110.8
15	107	0	130.1	1430	97.8
16	113	2245	125.5	645	103.2
17	121	2215	137.2	1300	110.8
18	117	445	134.8	1915	108.8
19	111	2330	119.0	1615	106.9
20	107	30	119.0	1745	101.4
21	142	2315	196.1	415	106.9
22	200	2330	226.1	800	182.6
23	222	800	226.1	1715	214.3
24	203	100	218.2	2330	182.6
25	164	0	182.6	2330	150.0
26	135	0	152.7	1415	127.8
27	123	0	132.4	1730	119.0
28	111	115	123.3	2015	105.0
29	109	2330	127.8	1315	103.2
30	137	1745	142.2	0	127.8
31	121	0	134.8	2330	112.8
TOTAL	3,869				
AVERAGE	125		141.3		113.7
MAXIMUM	222		226.1		214.3
MINIMUM	70		83.3		66.1
ACRE FT	7,675				

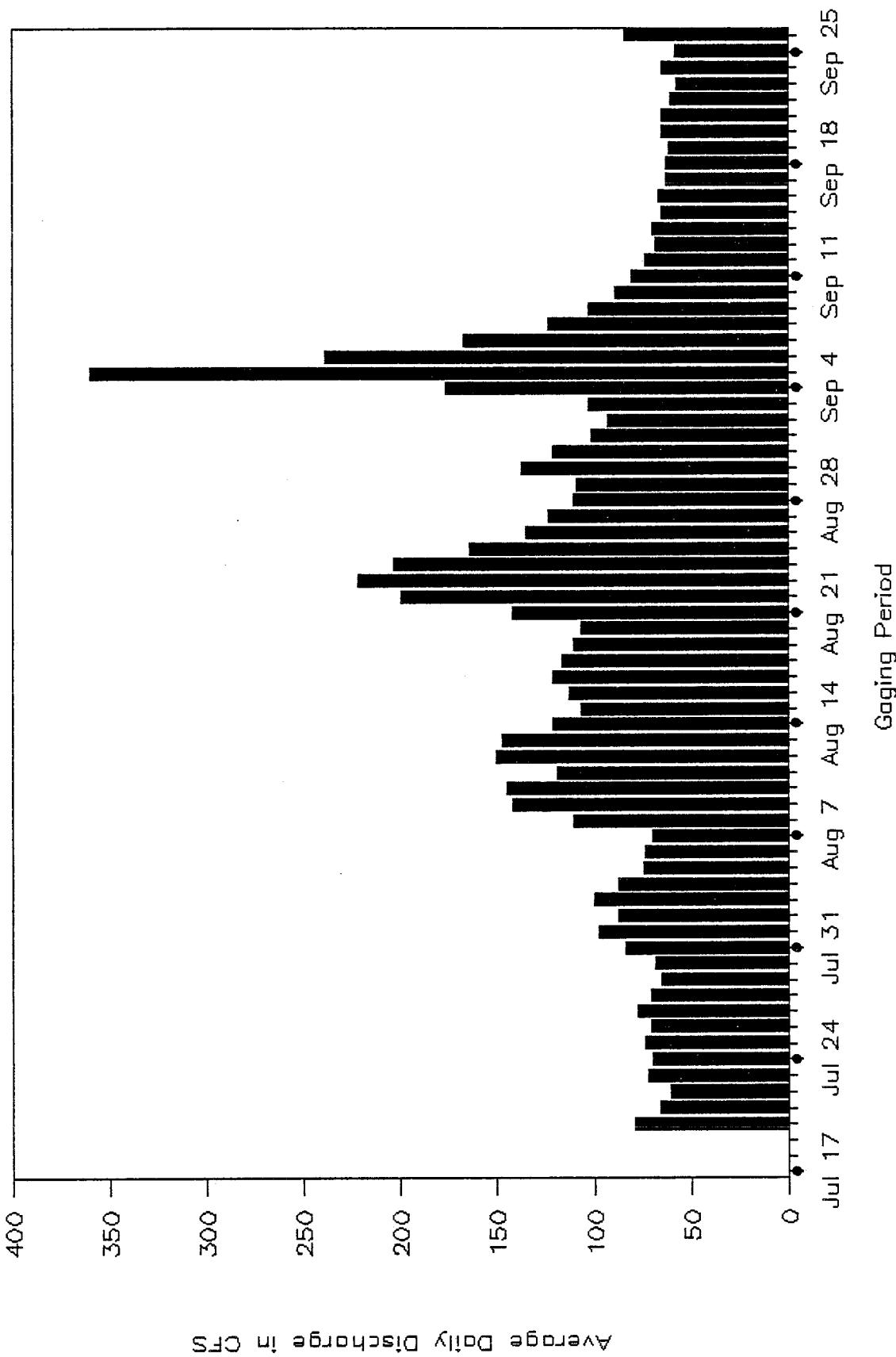
ARCTIC NATIONAL WILDLIFE REFUGE

Itkilyariak Creek

September 1988

DATE	AVE.DAILY	TIME	MAX	TIME	MIN
	DISCH. CU.FT/SEC	OF MAX	DISCH. CU.FT/SEC	OF MIN	DISCH. CU.FT/SEC
1	101	0	3.2	1300	91.1
2	93	2330	103.2	1000	79.0
3	103	2345	123.3	1300	94.4
4	176	2345	328.8	0	123.3
5	360	500	422.1	2345	295.5
6	239	0	295.5	2345	196.1
7	167	0	196.1	2245	142.2
8	123	0	142.2	1000	106.9
9	103	0	116.9	1430	94.4
10	89	15	97.8	1300	81.8
11	80	15	87.9	1500	76.2
12	74	0	77.6	1545	72.2
13	68	0	72.2	1215	61.5
14	70	700	84.8	930	56.3
15	65	0	71.0	1545	60.4
16	67	500	71.0	1730	64.9
17	63	2030	66.1	745	59.4
18	63	15	64.9	1615	60.4
19	62	500	62.6	1915	60.4
20	65	2215	68.5	30	62.6
21	65	15	68.5	1115	62.6
22	60	0	67.3	1045	58.3
23	57	0	60.4	1130	55.3
24	65	715	79.0	1115	52.4
25	58	2345	83.3	545	50.6
26	85	615	105.0	1900	61.5
27	- - -	- - -	- - -	- - -	- - -
28	- - -	- - -	- - -	- - -	- - -
29	- - -	- - -	- - -	- - -	- - -
30	- - -	- - -	- - -	- - -	- - -
31	- - -	- - -	- - -	- - -	- - -
TOTAL	2,621				
AVERAGE	101		116.1		87.7
MAXIMUM	360		422.1		295.5
MINIMUM	57		3.2		50.6
ACRE FT	5,199				

Itkilyariak Creek Gaging Station
1988



ARCTIC NATIONAL WILDLIFE REFUGE

Sadlerochit River

Location: Lat $69^{\circ} 38'$, Long $144^{\circ} 22'50''$, in NW1/4SW1/4 sec. 31, T.4N., R.32E., 0.5 miles below the Wilderness boundary, 37.5 miles southwest of Kaktovik, Alaska.

Drainage Area: 520.1 mi², of which 517.5 mi² is located within the Arctic National Wildlife Refuge Wilderness Area. Glaciers account for 2.3 percent of the drainage area or about 11.8 mi² depending on existing climatic conditions.

Remarks: This is a 6th Order drainage. Discharge records are initiated during break-up and discontinued at freeze-up of each year.

Extremes: Maximum Discharge, 2193.9 cfs Aug. 22, 1988; Minimum Discharge, 70.2 cfs Sept. 27, 1988.

JULY 1988					
	AVE.DAILY DISCH.	TIME OF MAX	MAX DISCH.	TIME OF MIN	MIN DISCH.
DATE	CU.FT/SEC		CU.FT/SEC		CU.FT/SEC
1	- - -	- - -	- - -	- - -	- - -
2	- - -	- - -	- - -	- - -	- - -
3	- - -	- - -	- - -	- - -	- - -
4	- - -	- - -	- - -	- - -	- - -
5	- - -	- - -	- - -	- - -	- - -
6	- - -	- - -	- - -	- - -	- - -
7	- - -	- - -	- - -	- - -	- - -
8	- - -	- - -	- - -	- - -	- - -
9	- - -	- - -	- - -	- - -	- - -
10	- - -	- - -	- - -	- - -	- - -
11	- - -	- - -	- - -	- - -	- - -
12	- - -	- - -	- - -	- - -	- - -
13	- - -	- - -	- - -	- - -	- - -
14	- - -	- - -	- - -	- - -	- - -
15	- - -	- - -	- - -	- - -	- - -
16	- - -	- - -	- - -	- - -	- - -
17	- - -	- - -	- - -	- - -	- - -
18	- - -	- - -	- - -	- - -	- - -
19	- - -	- - -	- - -	- - -	- - -
20	- - -	- - -	- - -	- - -	- - -
21	846	0	938.2	2315	754.7
22	702	0	754.7	2330	652.8
23	607	0	652.8	2345	558.9
24	520	0	558.9	2345	483.4
25	454	30	483.4	2345	431.3
26	385	0	431.3	2045	366.0
27	342	0	372.2	2345	315.0
28	- - -	- - -	- - -	- - -	- - -
29	- - -	- - -	- - -	- - -	- - -
30	- - -	- - -	- - -	- - -	- - -
31	- - -	- - -	- - -	- - -	- - -
TOTAL	3,856				
AVERAGE	551		598.8		508.9
MAXIMUM	846		938.2		754.7
MINIMUM	342		372.2		315.0
ACRE FT	7,649				

ARCTIC NATIONAL WILDLIFE REFUGE

Sadlerochit River

AUGUST 1988

	AVE.DAILY DISCH. DATE	TIME OF MAX	MAX DISCH. CU.FT/SEC	TIME OF MIN	MIN DISCH. CU.FT/SEC
1	- - -	- - -	- - -	- - -	- - -
2	- - -	- - -	- - -	- - -	- - -
3	- - -	- - -	- - -	- - -	- - -
4	- - -	- - -	- - -	- - -	- - -
5	- - -	- - -	- - -	- - -	- - -
6	- - -	- - -	- - -	- - -	- - -
7	- - -	- - -	- - -	- - -	- - -
8	- - -	- - -	- - -	- - -	- - -
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10	- - -	- - -	- - -	- - -	- - -
11	- - -	- - -	- - -	- - -	- - -
12	- - -	- - -	- - -	- - -	- - -
13	- - -	- - -	- - -	- - -	- - -
14	- - -	- - -	- - -	- - -	- - -
15	- - -	- - -	- - -	- - -	- - -
16	978	1500	1,084.6	0	794.9
17	928	0	998.3	2300	872.5
18	873	400	918.9	2300	828.5
19	828	600	854.6	2330	803.1
20	811	1430	828.5	2015	794.9
21	1,495	2130	1,897.7	30	819.9
22	1,937	1900	2,193.9	830	1,764.9
23	1,840	45	2,126.8	2345	1,641.5
24	1,450	45	1,658.6	2315	1,280.1
25	1,130	0	1,280.1	2345	1,008.7
26	928	0	1,008.7	2315	863.5
27	828	0	872.5	2215	778.6
28	747	0	778.6	2330	701.9
29	695	2330	739.3	1430	680.5
30	811	1615	828.5	0	739.3
31	771	30	828.5	2230	716.6
TOTAL	17,052				
AVERAGE	1,066		1,181.1		943.1
MAXIMUM	1,937		2,193.9		1,764.9
MINIMUM	695		739.3		680.5
ACRE FT	33,822				

ARCTIC NATIONAL WILDLIFE REFUGE

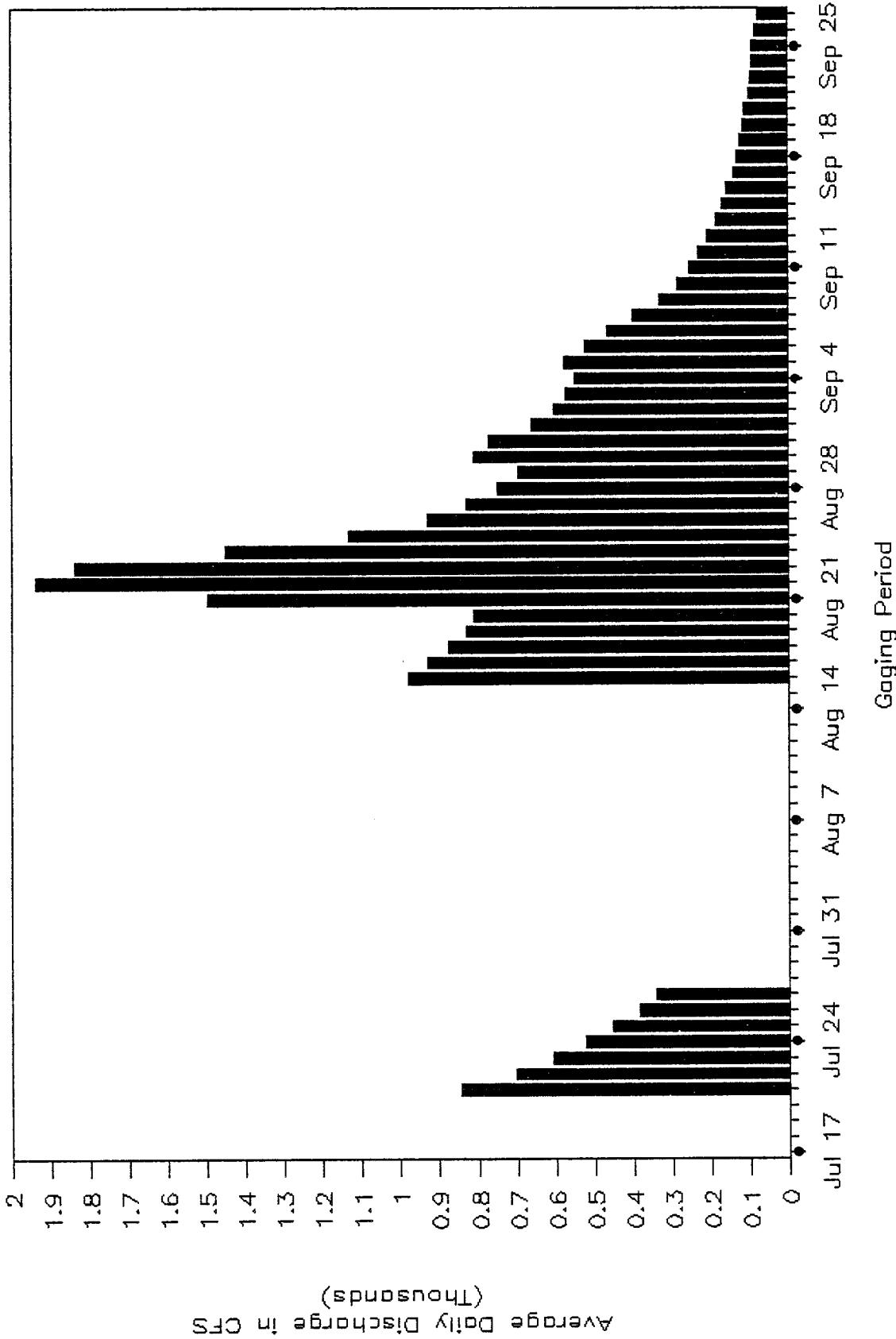
Sadlerochit River

September 1988

	AVE.DAILY DISCH. DATE CU.FT/SEC	TIME OF MAX	MAX DISCH. CU.FT/SEC	TIME OF MIN	MIN DISCH. CU.FT/SEC
1	660	0	716.6	1745	632.9
2	601	15	639.4	1045	576.5
3	571	15	600.9	2315	553.1
4	547	2330	582.5	1215	530.7
5	577	400	594.7	2245	547.4
6	520	100	547.4	2345	483.4
7	464	15	488.5	2315	440.4
8	398	0	440.4	2345	360.0
9	331	100	360.0	2345	309.8
10	285	0	309.8	2345	266.6
11	254	300	271.1	2345	237.2
12	229	630	237.2	2345	218.3
13	208	15	218.3	2345	197.5
14	185	0	197.5	1100	178.7
15	170	15	181.7	1515	161.7
16	159	945	167.1	2345	148.7
17	139	100	151.2	1745	130.1
18	132	15	139.1	2345	128.0
19	122	0	125.9	2330	117.8
20	116	0	117.8	2330	113.9
21	110	245	113.9	1545	106.5
22	101	0	110.2	1430	96.4
23	95	0	103.0	1600	90.2
24	92	915	104.8	2100	80.2
25	92	1415	108.3	2345	84.4
26	84	745	91.7	2200	71.4
27	76	2200	87.2	1145	70.2
28	- - -	- - -	- - -	- - -	- - -
29	- - -	- - -	- - -	- - -	- - -
30	- - -	- - -	- - -	- - -	- - -
TOTAL	7,316				
AVERAGE	271		289.1		256.7
MAXIMUM	660		716.6		632.9
MINIMUM	76		87.2		70.2
ACRE FT	14,512				

Sadlerochit River Gaging Station

1988



ARCTIC NATIONAL WILDLIFE REFUGE

Tamayariak River

Location: Lat $69^{\circ} 49' 58''$, Long $145^{\circ} 33' 10''$, in SW1/4NE1/4 sec. 35, T.6N., R.26E., 11.8 miles upstream from the confluence of the West Fork, Tamayariak River, 53 miles west-southwest of Kaktovik, Alaska.

Drainage Area: 136.1 mi², of which 56.8 mi² is located within the Arctic National Wildlife Refuge Wilderness Area.

Remarks: This is a 5th Order drainage. Discharge records are initiated during break-up and discontinued at freeze-up of each year.

Extremes: Maximum Discharge, 1,996 cfs Aug. 12, 1988; Minimum Discharge, 11.8 cfs Sept. 26, 1988.

JULY 1988

DATE	AVE.DAILY DISCH. CU.FT/SEC	TIME OF MAX	MAX DISCH. CU.FT/SEC	TIME OF MIN	MIN DISCH. CU.FT/SEC
1	- - -	- - -	- - -	- - -	- - -
2	- - -	- - -	- - -	- - -	- - -
3	- - -	- - -	- - -	- - -	- - -
4	- - -	- - -	- - -	- - -	- - -
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10	- - -	- - -	- - -	- - -	- - -
11	- - -	- - -	- - -	- - -	- - -
12	- - -	- - -	- - -	- - -	- - -
13	- - -	- - -	- - -	- - -	- - -
14	- - -	- - -	- - -	- - -	- - -
15	- - -	- - -	- - -	- - -	- - -
16	- - -	- - -	- - -	- - -	- - -
17	72	2345	134.2	230	51.3
18	124	30	135.9	2330	111.2
19	103	0	111.2	2315	71.7
20	59	0	71.7	2315	48.0
21	39	30	48.0	2345	34.4
22	30	15	34.4	2245	28.1
23	26	215	28.1	2345	24.6
24	25	815	26.3	130	24.6
25	25	1445	26.3	1145	23.0
26	23	2215	24.6	1400	21.5
27	22	0	24.6	2345	20.1
28	20	1415	20.1	1400	18.8
29	18	15	20.1	515	16.5
30	18	2300	18.8	900	16.5
31	23	2345	111.2	630	16.5
TOTAL	626				
AVERAGE	42		55.7		35.1
MAXIMUM	124		135.9		111.2
MINIMUM	18		18.8		16.5
ACRE FT	1241				

ARCTIC NATIONAL WILDLIFE REFUGE

Tamayariak River

AUGUST 1988

DATE	AVE.DAILY DISCH. CU.FT/SEC	TIME OF MAX	MAX DISCH. CU.FT/SEC	TIME OF MIN	MIN DISCH. CU.FT/SEC
1	508	2000	1163.4	0	114.0
2	508	45	1000.6	2345	267.7
3	459	1245	951.6	745	230.3
4	307	0	514.4	2315	213.6
5	177	0	213.6	2330	154.1
6	136	0	152.2	2345	122.9
7	120	2345	134.2	1530	112.6
8	225	2330	405.2	0	135.9
9	410	530	459.4	2345	344.2
10	289	115	348.5	2315	230.3
11	175	115	230.3	930	142.9
12	583	1445	1996.1	700	142.9
13	1039	100	1738.6	2330	590.6
14	395	0	583.2	2330	281.5
15	236	0	285.1	2215	210.9
16	201	30	213.6	2330	190.8
17	184	115	195.6	2315	174.7
18	173	330	176.9	2215	166.2
19	166	1645	168.3	2345	162.0
20	162	1645	168.3	745	156.0
21	307	2000	583.2	245	160.0
22	431	0	527.5	1230	390.2
23	416	2315	483.1	1230	380.5
24	416	100	501.6	2315	323.2
25	271	15	323.2	2300	227.4
26	219	0	233.2	1145	208.3
27	219	230	230.3	2345	198.1
28	186	100	203.1	2315	174.7
29	201	2345	327.3	730	170.4
30	336	630	385.4	2345	285.1
31	233	0	281.5	2330	200.6
TOTAL	9687				
AVERAGE	312		489.6		221.4
MAXIMUM	1039		1996.1		590.6
MINIMUM	120		134.2		112.6
ACRE FT	19214				

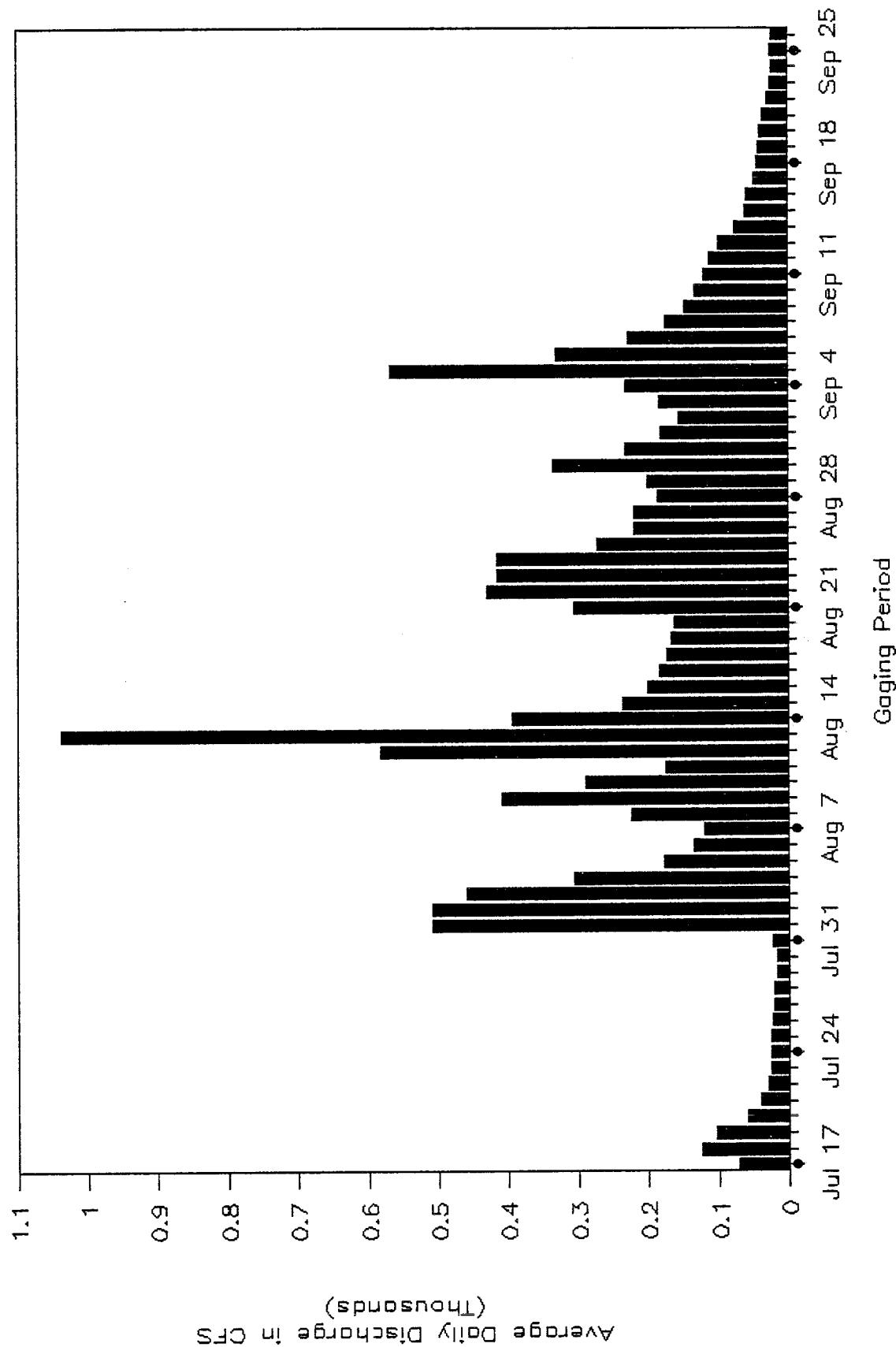
ARCTIC NATIONAL WILDLIFE REFUGE

Tamayariak River

SEPTEMBER 1988

DATE	AVE.DAILY DISCH. CU.FT/SEC	TIME OF MAX	MAX DISCH. CU.FT/SEC	TIME OF MIN	MIN DISCH. CU.FT/SEC
1	181	0	205.7	2345	168.3
2	156	2345	176.9	745	139.4
3	184	2300	200.6	30	172.5
4	233	2345	495.4	1000	190.8
5	569	530	678.0	2330	436.9
6	331	30	442.4	2345	264.4
7	227	15	264.4	2330	195.6
8	175	15	198.1	2330	156.0
9	148	0	158.0	2330	141.1
10	133	15	142.9	2345	127.6
11	121	30	127.6	2330	115.4
12	111	15	115.4	2315	105.7
13	100	15	105.7	2330	87.6
14	77	1515	111.2	1000	48.0
15	63	145	76.6	1330	58.6
16	59	115	62.7	2330	51.3
17	48	1630	81.9	1300	34.4
18	45	15	51.3	2230	42.0
19	42	1745	44.9	2030	36.7
20	39	800	51.3	345	36.7
21	37	1700	42.0	1200	30.1
22	30	0	36.7	1200	23.0
23	25	30	28.1	1330	20.1
24	23	1915	67.0	700	12.6
25	26	1730	54.8	1100	17.6
26	23	1930	67.0	1300	11.8
27	- - -	- - -	- - -	- - -	- - -
28	- - -	- - -	- - -	- - -	- - -
29	- - -	- - -	- - -	- - -	- - -
30	- - -	- - -	- - -	- - -	- - -
TOTAL	3206				
AVERAGE	123		157.2		104.8
MAXIMUM	569		678.0		436.9
MINIMUM	23		28.1		11.8
ACRE FT	6359				

Main Tamayariak River Gaging Station
1988



ARCTIC NATIONAL WILDLIFE REFUGE

Tamayariak River, Middle Fork

Location: Lat 69° 58'33", long 145°46'44", in the center sec 12, T.7N., R.25E., 0.4 miles upstream from the confluence with the West Fork Tamayariak River, 54 miles west-southwest of Kaktovik, Alaska.

Drainage Area: 61.3 mi² of which 0.79 mi² are located within the Arctic National Wildlife Refuge Wilderness Area.

Remarks: This is a 4th Order drainage. Discharge records are initiated during break-up and discontinued at freeze-up of each year.

Extremes: Maximum Discharge, 617.5 cfs Sept. 5, 1988; Minimum Discharge, 1.2 cfs August 6-7, 1988.

JULY 1988

DATE	AVE.DAILY DISCH. CU.FT/SEC	TIME	MAX	TIME	MIN
		OF MAX	DISCH. CU.FT/SEC	OF MIN	DISCH. CU.FT/SEC
1	- - -	- - -	- - -	- - -	- - -
2	- - -	- - -	- - -	- - -	- - -
3	- - -	- - -	- - -	- - -	- - -
4	- - -	- - -	- - -	- - -	- - -
5	- - -	- - -	- - -	- - -	- - -
6	- - -	- - -	- - -	- - -	- - -
7	- - -	- - -	- - -	- - -	- - -
8	- - -	- - -	- - -	- - -	- - -
9	- - -	- - -	- - -	- - -	- - -
10	- - -	- - -	- - -	- - -	- - -
11	- - -	- - -	- - -	- - -	- - -
12	- - -	- - -	- - -	- - -	- - -
13	- - -	- - -	- - -	- - -	- - -
14	- - -	- - -	- - -	- - -	- - -
15	- - -	- - -	- - -	- - -	- - -
16	- - -	- - -	- - -	- - -	- - -
17	- - -	- - -	- - -	- - -	- - -
18	8	715	12.2	2015	6.7
19	8	715	13.3	2045	6.7
20	7	1030	8.6	2230	5.2
21	5	1215	6.7	2000	4.3
22	4	1230	5.6	1930	3.6
23	4	1100	5.2	2030	3.6
24	4	1115	4.7	15	3.3
25	4	645	4.3	1615	3.3
26	3	845	4.0	1815	2.6
27	3	715	4.7	1645	2.6
28	3	730	3.6	1900	2.2
29	2	1015	3.1	1900	2.0
30	2	1030	3.6	1715	1.8
31	3	1030	4.3	145	2.0
TOTAL		60			
AVERAGE	4		84.1		50.0
MAXIMUM	8		13.3		6.7
MINIMUM	2		3.1		1.8
ACRE FT	118				

ARCTIC NATIONAL WILDLIFE REFUGE
Tamayariak River, Middle Fork

AUGUST 1988

DATE	AVE.DAILY	TIME	MAX	TIME	MIN
	DISCH. CU.FT/SEC	OF MAX	DISCH. CU.FT/SEC	OF MIN	DISCH. CU.FT/SEC
1	2	1030	2.8	1700	2.2
2	2	830	3.1	1430	1.5
3	3	445	3.6	2215	2.2
4	2	1000	2.6	2015	1.7
5	2	815	2.4	1945	1.3
6	1	730	2.0	1800	1.2
7	2	2345	5.6	1630	1.2
8	159	2300	524.2	0	6.1
9	351	145	532.1	2345	202.2
10	135	0	199.2	2345	97.5
11	84	0	97.5	1600	79.1
12	127	2345	211.4	15	82.8
13	196	445	224.4	2345	154.7
14	118	0	152.4	2345	91.9
15	77	0	91.9	2300	69.2
16	77	2145	81.5	0	69.2
17	79	15	80.3	2345	75.7
18	72	215	75.7	1245	71.3
19	75	2015	78.0	245	71.3
20	75	0	76.8	930	72.4
21	159	1830	335.4	430	72.4
22	218	0	289.0	1200	196.3
23	193	2230	241.7	1115	169.1
24	179	15	238.2	2345	129.4
25	97	0	129.4	2345	79.1
26	72	2345	82.8	1200	66.2
27	82	545	85.3	2345	74.6
28	66	0	74.6	2345	60.5
29	82	2345	238.2	800	58.8
30	199	345	256.6	2345	139.4
31	100	0	139.4	2345	79.1
TOTAL	3089				
AVERAGE	100		147.0		73.5
MAXIMUM	351		532.1		202.2
MINIMUM	1		2.0		1.2
ACRE FT	6126				

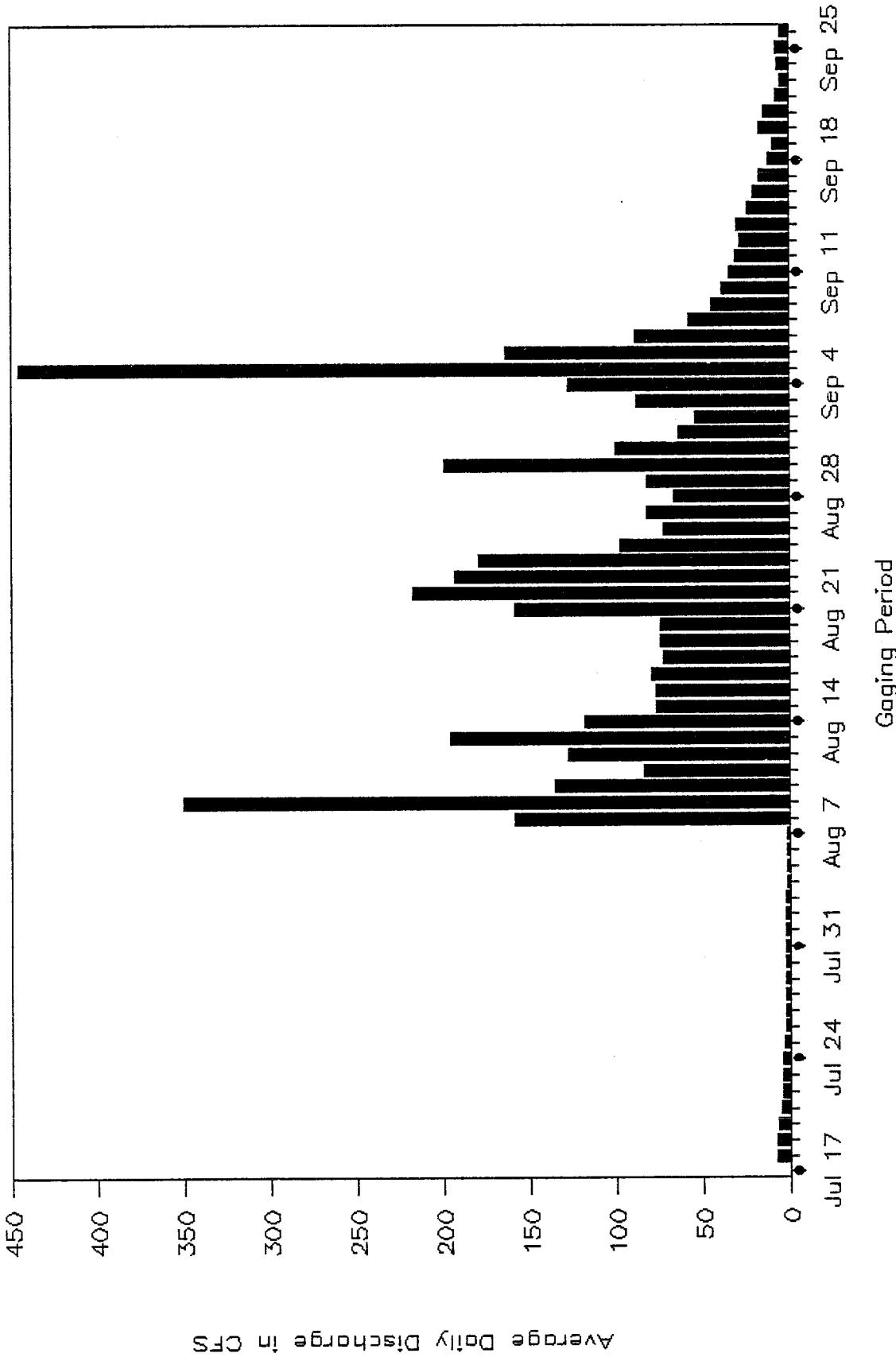
ARCTIC NATIONAL WILDLIFE REFUGE

Tamayariak River, Middle Fork

SEPTEMBER 1988

DATE	AVE.DAILY DISCH. CU.FT/SEC	TIME OF MAX	MAX DISCH. CU.FT/SEC	TIME OF MIN	MIN DISCH. CU.FT/SEC
1	64	0	78.0	2345	57.9
2	55	2345	72.4	1315	48.4
3	88	2330	103.5	0	73.5
4	127	2345	501.3	1200	89.2
5	445	530	617.5	2345	260.4
6	164	0	256.6	2345	116.6
7	89	0	114.8	2345	70.3
8	58	0	70.3	2345	51.4
9	45	0	50.6	2345	41.7
10	39	0	41.7	2345	36.5
11	34	0	36.5	2345	32.4
12	31	0	32.4	2345	29.6
13	29	15	29.6	2330	27.9
14	31	715	47.7	215	26.3
15	24	0	26.7	1530	20.5
16	21	15	26.3	2330	17.3
17	17	730	29.2	1545	11.2
18	12	0	14.5	2345	11.2
19	9	15	11.2	1615	7.9
20	17	730	39.3	115	7.9
21	15	730	32.9	1745	6.7
22	8	745	18.8	1815	5.2
23	6	815	22.4	1830	4.0
24	7	130	24.4	945	3.6
25	8	1015	28.8	1830	3.3
26	6	1300	22.4	730	1.7
27	- - -	- - -	- - -	- - -	- - -
28	- - -	- - -	- - -	- - -	- - -
29	- - -	- - -	- - -	- - -	- - -
30	- - -	- - -	- - -	- - -	- - -
TOTAL	1449				
AVERAGE	56		90.4		40.9
MAXIMUM	445		617.5		260.4
MINIMUM	6		11.2		1.7
ACRE FT	2873				

Middle Fork of the Tamayariak River
Gaging Station - 1988



ARCTIC NATIONAL WILDLIFE REFUGE

Tamayariak River, Lower West Fork

Location: Lat $69^{\circ} 58' 50''$, Long $145^{\circ} 47' 40''$, NW1/4NW1/4 sec 12, T.7N., R.25E., 1.5 miles upstream from the confluence with the Tamayariak River, 54 miles west-southwest of Kaktovik, Alaska.

Drainage Area: 98.14 mi^2 , of which 5.55 mi^2 are located within the Arctic National Wildlife Refuge Wilderness Area.

Remarks: This is a 4th Order drainage. Discharge records are initiated during break-up and discontinued at freeze-up of each year.

Extremes: Maximum Discharge, 495.8 cfs Sept. 5, 1988; Minimum Discharge, 9.0 cfs August 6-7, 1988.

JULY 1988

DATE	AVE.DAILY DISCH. CU.FT/SEC	TIME	MAX	TIME	MIN
		OF MAX	DISCH. CU.FT/SEC	OF MIN	DISCH. CU.FT/SEC
1	- - -	- - -	- - -	- - -	- - -
2	- - -	- - -	- - -	- - -	- - -
3	- - -	- - -	- - -	- - -	- - -
4	- - -	- - -	- - -	- - -	- - -
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10	- - -	- - -	- - -	- - -	- - -
11	- - -	- - -	- - -	- - -	- - -
12	- - -	- - -	- - -	- - -	- - -
13	- - -	- - -	- - -	- - -	- - -
14	- - -	- - -	- - -	- - -	- - -
15	- - -	- - -	- - -	- - -	- - -
16	- - -	- - -	- - -	- - -	- - -
17	17	1000	18.6	2130	16.5
18	16	545	16.5	2030	15.3
19	15	715	16.1	2130	15.0
20	15	745	15.7	2300	14.6
21	15	930	15.3	2015	14.2
22	15	830	15.0	2315	13.9
23	14	915	14.2	2100	13.9
24	15	1145	15.3	15	13.9
25	14	900	13.9	2330	13.2
26	13	1030	13.2	1630	12.6
27	13	815	12.9	1845	11.7
28	12	1100	12.3	2030	11.2
29	11	1330	11.7	2300	10.9
30	11	1015	11.4	2145	10.4
31	11	1400	12.0	0	10.6
TOTAL		206			
AVERAGE		14	14.3		13.2
MAXIMUM		17	18.6		16.5
MINIMUM		11	11.4		10.4
ACRE FT		409			

ARCTIC NATIONAL WILDLIFE REFUGE

Tamayariak River, Lower West Fork

AUGUST 1988

DATE	AVE.DAILY DISCH. CU.FT/SEC	TIME OF MAX	MAX DISCH. CU.FT/SEC	TIME OF MIN	MIN DISCH. CU.FT/SEC
1	11	30	10.9	915	10.4
2	10	1015	10.9	2230	10.1
3	11	1100	11.2	115	10.1
4	10	0	10.6	2330	9.9
5	10	1045	10.1	2045	9.4
6	9	945	9.9	2100	9.0
7	10	2345	14.6	1700	9.0
8	42	2345	84.6	0	15.0
9	79	330	95.5	2200	58.6
10	191	330	238.4	0	109.7
11	122	0	151.4	2315	108.1
12	156	2330	386.5	415	106.5
13	392	915	467.6	2345	288.3
14	194	0	288.3	2315	140.7
15	110	100	140.7	2345	86.6
16	81	15	86.6	2130	74.8
17	73	130	76.7	2330	64.7
18	59	0	67.9	2330	54.5
19	56	1515	57.2	430	54.5
20	60	1330	63.1	30	55.9
21	141	2245	369.9	0	60.1
22	306	300	375.3	2000	260.2
23	249	315	288.3	1845	218.3
24	249	415	292.6	2245	194.2
25	149	30	197.0	2330	121.5
26	106	0	121.5	2300	93.2
27	98	1015	104.9	245	91.0
28	85	15	95.5	2345	73.0
29	87	2345	140.7	615	69.6
30	225	1015	264.1	0	142.7
31	147	30	199.9	2330	116.3
TOTAL	3525				
AVERAGE	114		152.7		87.9
MAXIMUM	392		467.6		288.3
MINIMUM	9		9.9		9.0
ACRE FT	6993				

ARCTIC NATIONAL WILDLIFE REFUGE

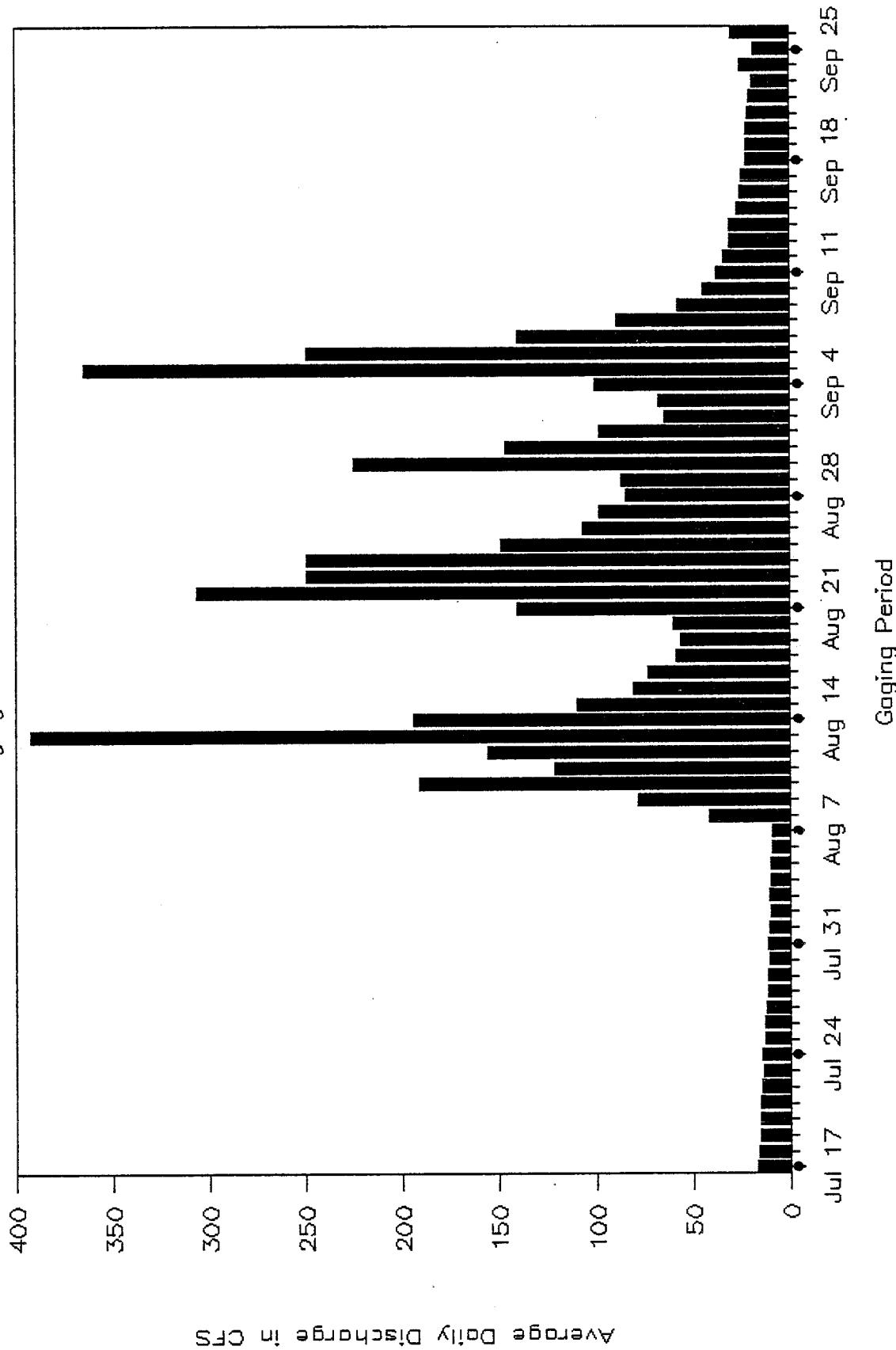
Tamayariak River, Lower West Fork

SEPTEMBER 1988

DATE	AVE.DAILY DISCH. CU.FT/SEC	TIME OF MAX	MAX DISCH. CU.FT/SEC	TIME OF MIN	MIN DISCH. CU.FT/SEC
1	98	15	118.0	2345	76.7
2	65	100	76.7	2230	58.6
3	68	1700	78.6	430	57.2
4	100	2345	172.7	130	73.0
5	364	1430	495.8	0	177.8
6	249	200	354.0	2330	180.4
7	141	15	180.4	2230	112.9
8	89	0	112.9	2345	67.9
9	57	45	67.9	2345	49.4
10	45	45	49.4	2230	40.7
11	38	30	40.7	2345	35.1
12	33	15	35.1	2245	31.9
13	31	0	31.9	2345	28.9
14	31	845	47.1	2345	26.9
15	27	30	27.5	2000	25.6
16	26	130	26.9	2245	24.4
17	24	745	25.6	2345	23.2
18	23	430	23.2	2215	21.6
19	23	1600	23.8	0	22.1
20	23	1130	25.6	615	20.5
21	22	530	23.2	230	20.0
22	21	930	22.1	2100	19.6
23	19	1030	22.1	2230	16.1
24	26	1015	67.9	0	17.7
25	18	1030	28.2	230	13.9
26	30	930	50.7	0	18.6
27	- - -	- - -	- - -	- - -	- - -
28	- - -	- - -	- - -	- - -	- - -
29	- - -	- - -	- - -	- - -	- - -
30	- - -	- - -	- - -	- - -	- - -
TOTAL	1689				
AVERAGE	65		85.7		48.5
MAXIMUM	364		495.8		180.4
MINIMUM	18		22.1		13.9
ACRE FT	3349				

Lower West Fork of the Tamayariak River

Gaging Station - 1988



ARCTIC NATIONAL WILDLIFE REFUGE

Tamayariak River, Upper West Fork

Location: Lat $69^{\circ} 49'58''$, long $145^{\circ} 55'15''$, in the center W1/2W1/2 sec 33, T.6N., R.25E., 13.9 miles upstream from the confluence with the Tamayariak River, 61.1 miles west-southwest of Kaktovik, Alaska.

Drainage Area: 49.2 mi², of which 5.6 mi² are located within the Arctic National Wildlife Refuge Wilderness Area.

Remarks: This is a 4th Order drainage. Discharge records are initiated during break-up and discontinued at freeze-up of each year.

Extremes: Maximum Discharge, 404 cfs Aug 13, 1988; Minimum Discharge, 0.8 cfs July 29-31, 1988.

JULY 1988

DATE	AVE.DAILY DISCH. CU.FT/SEC	TIME	MAX	TIME	MIN
		OF MAX	DISCH. CU.FT/SEC	OF MIN	DISCH. CU.FT/SEC
1	- - -	- - -	- - -	- - -	- - -
2	- - -	- - -	- - -	- - -	- - -
3	- - -	- - -	- - -	- - -	- - -
4	- - -	- - -	- - -	- - -	- - -
5	- - -	- - -	- - -	- - -	- - -
6	- - -	- - -	- - -	- - -	- - -
7	- - -	- - -	- - -	- - -	- - -
8	- - -	- - -	- - -	- - -	- - -
9	- - -	- - -	- - -	- - -	- - -
10	- - -	- - -	- - -	- - -	- - -
11	- - -	- - -	- - -	- - -	- - -
12	- - -	- - -	- - -	- - -	- - -
13	- - -	- - -	- - -	- - -	- - -
14	- - -	- - -	- - -	- - -	- - -
15	- - -	- - -	- - -	- - -	- - -
16	- - -	- - -	- - -	- - -	- - -
17	- - -	- - -	- - -	- - -	- - -
18	3	0	3.9	1345	2.8
19	2	0	2.9	2345	2.2
20	2	0	2.2	2345	1.4
21	1	0	1.4	2345	1.0
22	1	0	1.0	1945	0.9
23	1	2315	1.0	1415	0.9
24	1	1715	1.1	0	1.0
25	1	0	1.1	1200	1.0
26	1	2030	1.0	930	0.9
27	1	0	1.0	930	0.9
28	1	2030	1.0	545	0.9
29	1	0	1.0	1500	0.8
30	1	1830	0.9	945	0.8
31	1	1930	1.2	530	0.8
TOTAL		17.7			
AVERAGE		1.3		1.5	1.2
MAXIMUM		3.1		3.9	2.8
MINIMUM		0.8		0.9	0.8
ACRE FT		35.0			

ARCTIC NATIONAL WILDLIFE REFUGE

Tamayariak River, Upper West Fork

AUGUST 1988

DATE	AVE.DAILY DISCH. CU.FT/SEC	TIME OF MAX	MAX DISCH. CU.FT/SEC	TIME OF MIN	MIN DISCH. CU.FT/SEC
1	1	1445	1.3	845	1.1
2	1	0	1.2	2345	1.0
3	1	845	1.4	230	1.0
4	1	15	1.2	2345	1.0
5	1	2245	1.2	545	1.0
6	1	1800	1.3	530	1.2
7	2	2345	4.9	700	1.2
8	88	2315	281.9	0	5.2
9	240	500	311.5	2345	157.8
10	106	0	161.0	2330	73.8
11	60	0	72.4	2045	55.8
12	168	2130	373.0	0	60.4
13	271	315	404.1	2345	167.6
14	110	0	161.0	2330	75.3
15	60	0	75.3	1900	53.6
16	54	15	54.7	2330	51.5
17	48	100	51.5	2345	44.8
18	43	115	44.8	2245	40.5
19	41	1600	42.2	630	39.7
20	42	2145	47.5	745	38.9
21	143	1900	281.9	130	44.8
22	217	15	265.5	830	200.6
23	189	2330	235.5	1145	157.8
24	178	15	230.8	2330	126.7
25	94	0	126.7	2345	70.9
26	64	0	72.4	1115	58.1
27	65	300	69.5	2345	59.2
28	54	45	59.2	2345	48.5
29	70	2345	167.6	445	46.6
30	143	200	171.0	2345	107.9
31	78	15	107.9	2345	60.4
TOTAL	2636				
AVERAGE	85		125.2		59.8
MAXIMUM	271		404.1		200.6
MINIMUM	1		1.2		1.0
ACRE FT	5228				

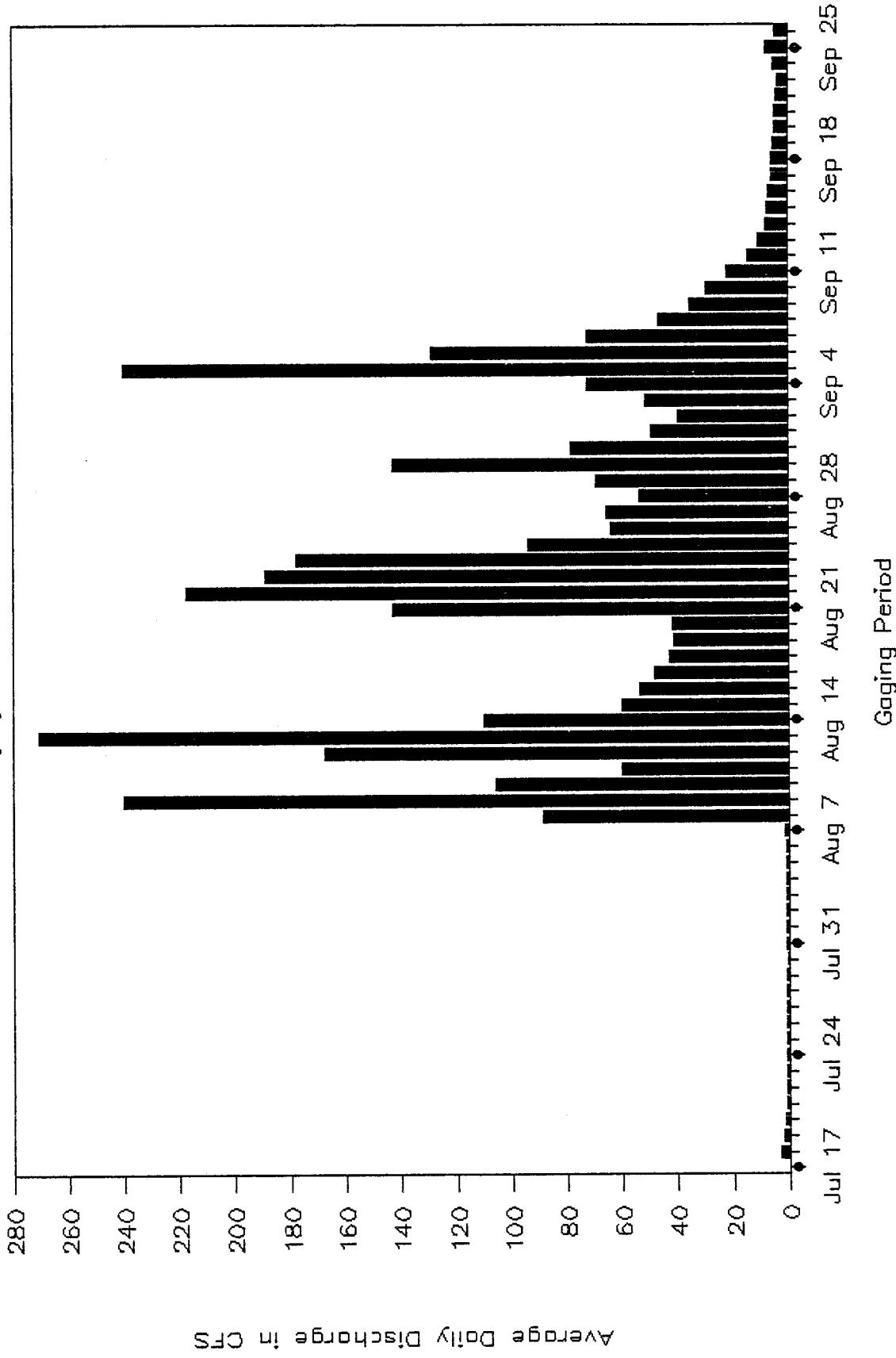
ARCTIC NATIONAL WILDLIFE REFUGE

Tamayariak River, Upper West Fork

SEPTEMBER 1988

DATE	AVE.DAILY DISCH. CU.FT/SEC	TIME OF MAX	MAX DISCH. CU.FT/SEC	TIME OF MIN	MIN DISCH. CU.FT/SEC
1	49	0	61.7	2230	43.0
2	40	2345	50.5	615	30.6
3	51	2330	58.1	830	48.5
4	72	2345	217.4	1045	53.6
5	240	1000	276.3	2345	192.8
6	129	15	192.8	2345	93.8
7	72	15	93.8	2345	56.9
8	47	15	56.9	2330	40.5
9	35	0	40.5	2300	32.5
10	29	0	32.5	2345	27.6
11	22	0	26.0	2345	17.4
12	15	30	17.4	2345	12.3
13	11	0	12.3	745	9.2
14	8	1045	19.5	800	2.5
15	7	0	8.2	915	6.5
16	7	0	7.8	2330	6.5
17	6	1500	7.8	645	3.3
18	6	0	6.5	2330	5.2
19	5	45	5.2	2345	4.9
20	5	1815	5.8	615	3.9
21	5	1730	5.8	715	3.7
22	4	0	5.5	800	3.5
23	4	1245	5.5	445	2.6
24	5	515	11.0	1015	2.9
25	8	515	19.5	1830	3.3
26	5	45	8.7	945	2.8
27	- - -	- - -	- - -	- - -	- - -
28	- - -	- - -	- - -	- - -	- - -
29	- - -	- - -	- - -	- - -	- - -
30	- - -	- - -	- - -	- - -	- - -
TOTAL	890				
AVERAGE	34		48.2		27.3
MAXIMUM	240		276.3		192.8
MINIMUM	4		5.2		2.5
ACRE FT	1764				

Upper West Fork of the Tamayariak River
Gaging Station - 1988



APPENDIX C

Surface water temperature records

ARCTIC NATIONAL WILDLIFE REFUGE

Itkilyariak Creek

Location: Lat $69^{\circ} 52' 35''$, Long $144^{\circ} 22'$, in SE1/4NW1/4 sec. 15, T.6N., R.31E., 6 miles upstream from the confluence with the Sadlerochit River, 24 miles southwest of Kaktovik, Alaska.

Drainage Area: 120.4 mi², of which 39 mi² is located within the Arctic National Wildlife Refuge Wilderness Area.

Remarks: Temperatures were recorded at 15 minute intervals.

Extremes: Maximum Temperature 14.9°C , July 28, 1988; Minimum Temperature 0.7°C , September 26, 1989.

JULY 1988

DATE	AVE. WATER	TIME	MAX	TIME	MIN
	TEMP DEG.C	OF MAX.T	TEMP DEG.C	OF MIN.T	TEMP DEG.C
1	- - -	- - -	- - -	- - -	- - -
2	- - -	- - -	- - -	- - -	- - -
3	- - -	- - -	- - -	- - -	- - -
4	- - -	- - -	- - -	- - -	- - -
5	- - -	- - -	- - -	- - -	- - -
6	- - -	- - -	- - -	- - -	- - -
7	- - -	- - -	- - -	- - -	- - -
8	- - -	- - -	- - -	- - -	- - -
9	- - -	- - -	- - -	- - -	- - -
10	- - -	- - -	- - -	- - -	- - -
11	- - -	- - -	- - -	- - -	- - -
12	- - -	- - -	- - -	- - -	- - -
13	- - -	- - -	- - -	- - -	- - -
14	- - -	- - -	- - -	- - -	- - -
15	- - -	- - -	- - -	- - -	- - -
16	- - -	- - -	- - -	- - -	- - -
17	- - -	- - -	- - -	- - -	- - -
18	- - -	- - -	- - -	- - -	- - -
19	- - -	- - -	- - -	- - -	- - -
20	8.5	1715	9.7	2345	7.1
21	7.2	1545	9.3	715	5.7
22	6.6	1715	9	630	4.8
23	7	1715	8.8	700	5.3
24	7.5	1745	9.7	500	5.9
25	9.2	1630	11	415	6.9
26	9.7	1445	12.2	500	7.6
27	11	1615	14	400	8.1
28	12	1700	14.9	445	9.2
29	11.8	1345	14.4	500	9.4
30	10.8	1430	12	515	9.6
31	10.9	1600	12.4	615	9.8

AVERAGE	9.4	11.5	7.5
MAXIMUM	12.0	14.9	9.8
MINIMUM	6.6	8.8	4.8

ARCTIC NATIONAL WILDLIFE REFUGE

Itkilyariak Creek

AUGUST 1988

DATE	AVE.WATER	TIME	MAX	TIME	MIN
	TEMP DEG.C	OF MAX.T	TEMP DEG.C	OF MIN.T	TEMP DEG.C
1	9.8	1030	11	2345	8.3
2	10.3	1545	13.6	345	7.9
3	8.9	0	10.7	2345	6.8
4	8.2	1745	10.4	430	6.2
5	9.7	1630	12.9	500	6.4
6	10.9	1500	13.6	445	8
7	11.4	1445	13.6	2345	8.5
8	7.2	0	8.4	700	6.2
9	7.6	1715	9.9	415	6
10	8.7	1615	11.9	515	5.5
11	9.4	1500	11.9	515	7.6
12	8.4	0	9.8	2345	6.9
13	8.5	1600	11.1	430	6.4
14	10	1615	12.9	545	7.3
15	10.7	1345	11.8	515	9.8
16	10.4	1645	11.7	515	9.2
17	11.5	1545	14.4	615	9
18	10.8	0	12	2345	9.1
19	8.5	1530	10.3	2345	6.8
20	7.4	1330	9.9	700	5.7
21	7.2	1545	8.5	530	6.1
22	5.8	0	7	2345	4.9
23	5.1	1615	6	700	4.4
24	5.8	1515	7.5	600	4.6
25	5.5	1530	6.5	2345	4.6
26	5.1	1845	6	600	4.2
27	5.2	1515	6.6	515	4.3
28	4.8	1600	5.9	530	3.9
29	4.2	1345	5	2330	2.5
30	2.9	1430	4.2	545	1.9
31	2.8	1445	4	545	1.7
AVERAGE	7.8		9.6		6.2
MAXIMUM	11.5		14.4		9.8
MINIMUM	2.8		4.0		1.7

ARCTIC NATIONAL WILDLIFE REFUGE

Itkilyariak Creek

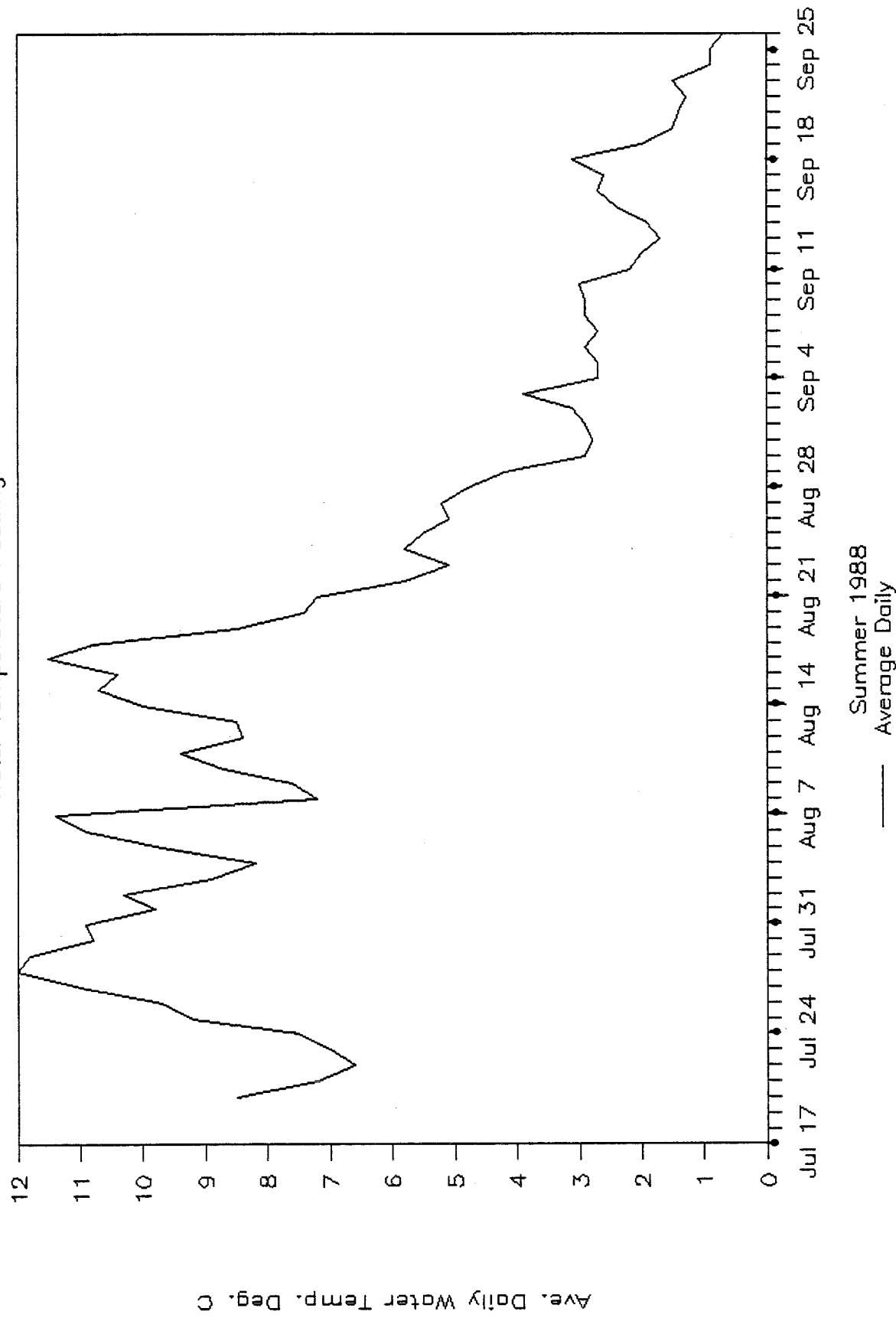
SEPTEMBER 1988

DATE	AVE.WATER	TIME	MAX	TIME	MIN
	TEMP DEG.C	OF MAX.T	TEMP DEG.C	OF MIN.T	TEMP DEG.C
1	2.9	1500	4.4	600	1.7
2	3.1	1600	5.5	645	0.8
3	3.9	1615	6.5	600	1.5
4	2.7	0	3.5	2345	2.3
5	2.7	1645	3.6	715	1.8
6	2.9	1530	3.4	745	2.5
7	2.7	1615	4.2	800	1.8
8	2.9	1615	5.2	715	0.9
9	2.9	1530	4.8	630	1.3
10	3	1615	4.4	715	1.8
11	2.2	1330	2.7	715	1.6
12	2	1430	2.9	2345	1.2
13	1.7	1515	3.4	630	0.7
14	1.9	1615	4	45	0.6
15	2.4	1530	4.3	530	0.8
16	2.7	1515	4.6	800	1.4
17	2.6	1515	4.7	630	0.7
18	3.1	1545	4.8	500	1.7
19	2	0	2.8	815	1.7
20	1.5	1545	2.2	800	0.7
21	1.4	1445	2.5	500	0.7
22	1.3	1415	2.9	630	0.6
23	1.5	1445	2.8	630	0.7
24	0.9	1500	1.8	200	0.6
25	0.9	1430	1.5	2045	0.5
26	0.7	1545	1.2	1845	0.5
27	- - -	- - -	- - -	- - -	- - -
28	- - -	- - -	- - -	- - -	- - -
29	- - -	- - -	- - -	- - -	- - -
30	- - -	- - -	- - -	- - -	- - -

AVERAGE	2.3	3.6	1.2
MAXIMUM	3.9	6.5	2.5
MINIMUM	0.7	1.2	0.5

Itkilyariak Creek

Water Temperature Readings



ARCTIC NATIONAL WILDLIFE REFUGE

Sadlerochit River

Location: Lat 69° 38', Long 144° 22'50", in NW1/4SW1/4 sec. 31, T.4N., R.32E., 0.5 miles below the Wilderness boundary, 37.5 miles southwest of Kaktovik, Alaska.

Drainage Area: 520.1 mi², of which 517.5 mi² is located within the Arctic National Wildlife Refuge Wilderness Area. Glaciers account for 2.3 percent of the drainage area or about 11.8 mi² depending on existing climatic conditions.

Remarks: Temperatures were recorded at 15 minute intervals.

Extremes: Maximum Temperature 14.9 °C, July 28, 1988; Minimum Temperature -0.1 °C, September 27, 1988.

JULY 1988

DATE	AVE. WATER	TIME	MAX	TIME	MIN
	TEMP DEG.C	OF MAX.T	TEMP DEG.C	OF MIN.T	TEMP DEG.C
1	- - -	- - -	- - -	- - -	- - -
2	- - -	- - -	- - -	- - -	- - -
3	- - -	- - -	- - -	- - -	- - -
4	- - -	- - -	- - -	- - -	- - -
5	- - -	- - -	- - -	- - -	- - -
6	- - -	- - -	- - -	- - -	- - -
7	- - -	- - -	- - -	- - -	- - -
8	- - -	- - -	- - -	- - -	- - -
9	- - -	- - -	- - -	- - -	- - -
10	- - -	- - -	- - -	- - -	- - -
11	- - -	- - -	- - -	- - -	- - -
12	- - -	- - -	- - -	- - -	- - -
13	- - -	- - -	- - -	- - -	- - -
14	- - -	- - -	- - -	- - -	- - -
15	- - -	- - -	- - -	- - -	- - -
16	- - -	- - -	- - -	- - -	- - -
17	- - -	- - -	- - -	- - -	- - -
18	- - -	- - -	- - -	- - -	- - -
19	- - -	- - -	- - -	- - -	- - -
20	- - -	- - -	- - -	- - -	- - -
21	7.3	0	8.4	815	6.5
22	6.9	1930	8.1	830	5.9
23	7.6	1515	9.8	715	5.8
24	7.7	2030	9.5	800	6.2
25	9.6	1645	11.7	530	7.3
26	10.6	1715	13.7	615	8.1
27	11.7	1530	14.3	615	9.2
28	12.1	1700	14.9	530	9.3
29	11.7	1600	14.5	545	9.5
30	10.8	1430	12	715	9.9
31	10.6	1600	12	2345	9.4

AVERAGE	9.7	11.7	7.9
MAXIMUM	12.1	14.9	9.9
MINIMUM	6.9	8.1	5.8

ARCTIC NATIONAL WILDLIFE REFUGE

Sadlerochit River

AUGUST 1988

DATE	AVE.WATER	TIME	MAX	TIME	MIN
	TEMP DEG.C	OF MAX.T	TEMP DEG.C	OF MIN.T	TEMP DEG.C
1	8.8	1845	10.7	715	6.5
2	9.5	1730	12.5	615	6.9
3	9.5	0	11.1	2345	6.9
4	7.5	1915	10.2	545	5.1
5	9.3	1815	12.4	630	6.2
6	10.7	1800	12.6	615	8.3
7	11.2	1515	13.1	730	9.9
8	6.9	0	10.1	2345	5.7
9	6.7	1745	9.1	600	5
10	7.5	1845	10.3	630	4.6
11	8.5	2000	10.2	800	6.9
12	7.3	0	9.3	2345	5.4
13	6.9	2000	9.6	600	4.5
14	8.5	1745	10.8	645	6.1
15	9.5	1815	10.1	730	8.8
16	9.2	1900	10.6	745	8
17	10	1715	12.4	645	7.5
18	10.3	0	11.3	2345	9.4
19	8.4	1645	9.4	745	7.5
20	8.1	1415	9.5	715	6.5
21	8.4	1615	9.3	715	7.7
22	6.5	0	8.2	2345	5.5
23	5.3	1800	6.2	730	4.7
24	6.1	1915	7.8	630	4.7
25	6.4	1730	7.6	745	5.1
26	6.9	1945	8	615	5.6
27	7.2	1900	8.1	815	6
28	7.2	1545	8.6	730	5.9
29	6.1	0	7.5	2345	4.2
30	3.9	1715	4.8	800	3
31	2.8	1600	3.5	745	2
AVERAGE	7.8		9.5		6.1
MAXIMUM	11.2		13.1		9.9
MINIMUM	2.8		3.5		2.0

ARCTIC NATIONAL WILDLIFE REFUGE

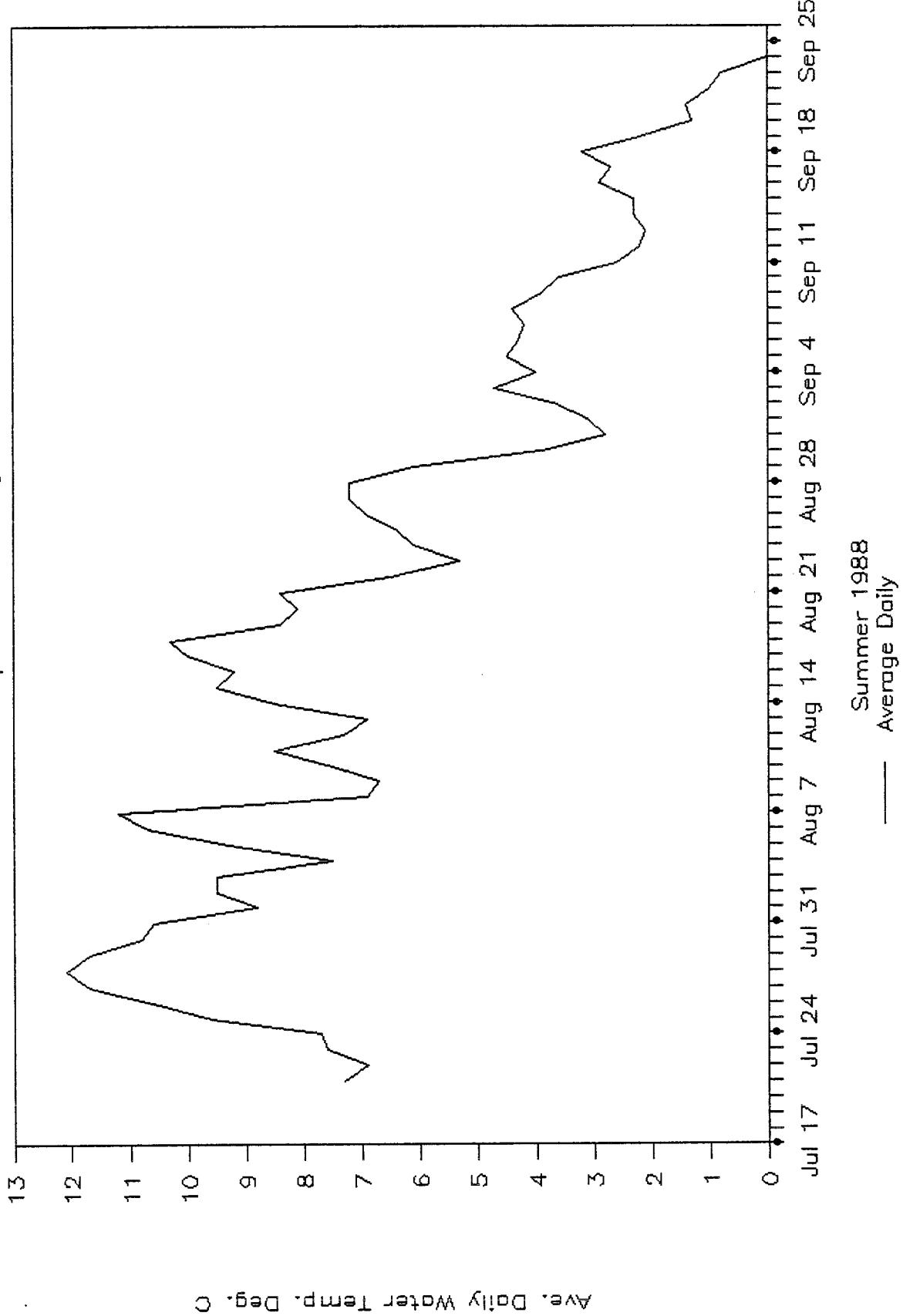
Sadlerochit River

SEPTEMBER 1988

DATE	AVE.WATER	TIME	MAX	TIME	MIN
	TEMP DEG.C	OF MAX.T	TEMP DEG.C	OF MIN.T	TEMP DEG.C
1	3.1	1845	4.5	615	1.8
2	3.7	1845	5.4	700	1.5
3	4.7	1730	6.9	715	2.4
4	4	0	5.2	700	3.3
5	4.5	1530	5.4	830	3.8
6	4.3	1745	5	1000	3.7
7	4.2	1630	5.3	800	3.2
8	4.4	1700	6.4	800	2.4
9	3.9	1700	5.4	800	2.2
10	3.6	1645	5.4	745	1.8
11	2.6	0	3.5	830	2
12	2.2	1630	3.1	730	1.5
13	2.1	1600	3.7	730	0.9
14	2.3	1715	4.3	745	0.6
15	2.3	1715	3.6	730	0.9
16	2.9	1630	5	815	1.2
17	2.7	1645	4.6	800	0.7
18	3.2	1700	5.3	645	1.5
19	2.2	0	3.3	2345	1.7
20	1.3	1530	1.7	915	0.5
21	1.4	1600	2.8	745	0.4
22	1	1645	2	930	0.3
23	0.8	1630	1.9	745	-0.1
24	0	1800	0.2	200	-0.2
25	0	1715	0.5	2300	-0.2
26	0	1615	0.7	0	-0.1
27	-0.1	1400	0.1	0	-0.1
28	- - -	- - -	- - -	- - -	- - -
29	- - -	- - -	- - -	- - -	- - -
30	- - -	- - -	- - -	- - -	- - -
AVERAGE	2.5		3.7		1.4
MAXIMUM	4.7		6.9		3.8
MINIMUM	-0.1		0.1		-0.2

Sadlerochit River

Water Temperature Readings



ARCTIC NATIONAL WILDLIFE REFUGE

Tamayariak River

Location: Lat 69° 49'58", long 145° 33'10", in SW1/4NE1/4 sec. 35, T.6N., R.26E., 11.8 miles upstream from the confluence of the West Fork, Tamayariak River, 53 miles west-southwest of Kaktovik, Alaska.

Drainage Area: 136.1 mi², of which 56.8 mi² is located within the Arctic National Wildlife Refuge Wilderness Area.

Remarks: Temperatures were recorded at 15 minute intervals. A malfunction occurred Aug. 11-12, 1988.

Extremes: Maximum Temperature 16.4 °C, July 28, 1988.

JULY 1988

DATE	TEMP	TIME	TEMP	TIME	TEMP
	DEG. C AVG	OF MAX.T	DEG.C MAX	OF MIN.T	DEG.C MIN
1	- - -	- - -	- - -	- - -	- - -
2	- - -	- - -	- - -	- - -	- - -
3	- - -	- - -	- - -	- - -	- - -
4	- - -	- - -	- - -	- - -	- - -
5	- - -	- - -	- - -	- - -	- - -
6	- - -	- - -	- - -	- - -	- - -
7	- - -	- - -	- - -	- - -	- - -
8	- - -	- - -	- - -	- - -	- - -
9	- - -	- - -	- - -	- - -	- - -
10	- - -	- - -	- - -	- - -	- - -
11	- - -	- - -	- - -	- - -	- - -
12	- - -	- - -	- - -	- - -	- - -
13	- - -	- - -	- - -	- - -	- - -
14	- - -	- - -	- - -	- - -	- - -
15	- - -	- - -	- - -	- - -	- - -
16	- - -	- - -	- - -	- - -	- - -
17	12.5	0	14.5	1030	11.1
18	12	1345	13.6	530	10.1
19	11.3	1200	12	2345	10.3
20	10	1745	10.7	2345	8.6
21	8	1530	9.8	815	6.6
22	7.4	1845	9.7	715	5.4
23	8.4	1745	10.9	515	6.4
24	8.9	1745	11.5	630	7
25	10.7	1515	13.1	500	8.3
26	11.7	1645	15.1	545	8.5
27	12.3	1800	15.2	600	9.2
28	13	1600	16.4	445	9.6
29	12.5	1745	15.5	530	9.4
29	12.5	1630	15	445	10.5
30	12.5	1645	12.4	700	10.6

AVERAGE	10.9	13.0	8.8
MAXIMUM	13.0	16.4	11.1
MINIMUM	7.4	9.7	5.4

ARCTIC NATIONAL WILDLIFE REFUGE

Tamayariak River

AUGUST 1988

DATE	TEMP	TIME	TEMP	TIME	TEMP
	DEG. C AVG	OF MAX.T	DEG.C MAX	OF MIN.T	DEG.C MIN
1	9.7	0	10.5	2345	8
2	9.7	1530	12.8	445	7
3	8.7	0	10.6	2345	6.5
4	8.1	1800	11.2	645	5.2
5	10	1745	14.1	600	5.9
6	11.8	1530	14.7	530	8.8
7	12.2	1515	14.1	2345	9
8	6.9	0	8.9	2345	6
9	7.5	1700	10.9	545	4.9
10	8.5	1715	12.3	615	4.7
11					
12					
13	7.2	1845	10.4	530	4.6
14	9	1645	12.3	600	5.8
15	10.4	1715	11.6	630	9.1
16	10	1700	11.8	630	8.3
17	11.4	1715	14.1	630	8.7
18	10.7	0	12.1	2345	8.9
19	7.4	1545	8.8	2345	5.6
20	6.8	1515	9.6	645	4.7
21	8.6	1545	11.1	630	6.8
22	6	0	8.1	2345	4.8
23	4.9	1400	6.2	645	3.5
24	5.4	1645	7.4	615	3.8
25	5.7	1630	8.2	700	4
26	4.9	1900	5.9	615	3.8
27	5.8	1715	7.6	715	4.2
28	5	1645	6.3	645	3.8
29	3.8	0	4.9	2345	1.8
29	2	1615	3.4	600	0.8
30	1.7	1745	3.6	630	0
AVERAGE	7.6		9.8		5.5
MAXIMUM	12.2		14.7		9.1
MINIMUM	1.7		3.4		0.0

ARCTIC NATIONAL WILDLIFE REFUGE

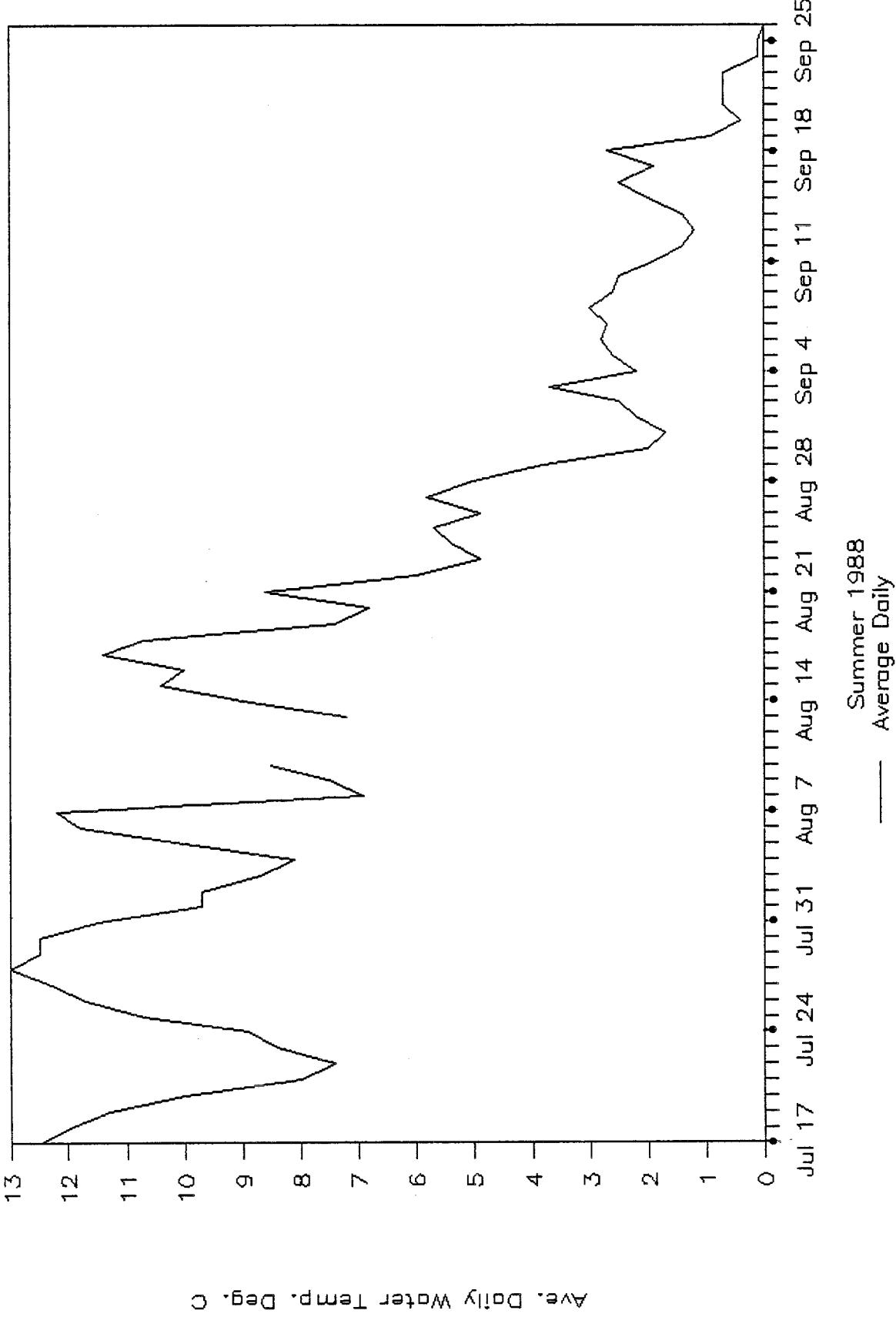
Tamayariak River

SEPTEMBER 1988

DATE	TEMP	TIME	TEMP	TIME	TEMP
	DEG. C AVG	OF MAX.T	DEG.C MAX	OF MIN.T	DEG.C MIN
1	2.2	1645	4.2	645	0.6
2	2.5	1730	5.2	615	-0.1
3	3.7	1700	6.8	615	0.8
4	2.2	0	4.1	800	1.5
5	2.6	1615	4.1	645	1.4
6	2.8	1700	3.8	800	2.1
7	2.7	1600	4.5	715	1.2
8	3	1715	6	700	0.3
9	2.6	1515	4.3	730	0.7
10	2.5	1615	4.7	730	0.5
11	1.9	1730	2.6	745	1.1
12	1.4	1515	2.5	800	0.6
13	1.2	1630	3.1	630	-0.1
14	1.4	1630	3.9	315	-0.1
15	2	1615	3.9	445	0.2
16	2.5	1630	4.7	730	0.5
17	1.9	1700	4.4	545	-0.1
18	2.7	1615	4.7	730	1.2
19	0.9	0	2.4	2345	0.4
20	0.4	1630	0.9	715	-0.1
21	0.7	1630	2.1	600	-0.1
22	0.7	1645	2	415	-0.1
23	0.7	1600	2.4	645	-0.1
24	0.1	1615	1	2115	-0.1
25	0.1	1545	0.8	2000	-0.1
26	0	1530	0.5	1815	-0.1
27	- - -	- - -	- - -	- - -	- - -
28	- - -	- - -	- - -	- - -	- - -
29	- - -	- - -	- - -	- - -	- - -
30	- - -	- - -	- - -	- - -	- - -
AVERAGE	1.7		3.4		0.5
MAXIMUM	3.7		6.8		2.1
MINIMUM	0.0		0.5		-0.1

Main Tamayariak River

Water Temperature Readings



ARCTIC NATIONAL WILDLIFE REFUGE

Tamayariak River, Middle Fork

Location: Lat 69° 58'33", Long 145° 46'44", in the center sec 12, T.7N., R.25E., 0.4 miles upstream from the confluence with the West Fork Tamayariak River, 54 miles west-southwest of Kaktovik, Alaska.

Drainage Area: 61.3 mi², of which 0.79 mi² are located within the Arctic National Wildlife Refuge Wilderness Area.

Remarks: Temperatures were recorded at 15 minute intervals.

Extremes: Maximum Temperature 14.2 °C, July 28, 1988; Minimum Temperature 0 °C, Sept. 26, 1988.

JULY 1988

DATE	AVE.WATER	TIME	MAX	TIME	MIN
	TEMP DEG.C	OF MAX.T	TEMP DEG.C	OF MIN.T	TEMP DEG.C
1	- - -	- - -	- - -	- - -	- - -
2	- - -	- - -	- - -	- - -	- - -
3	- - -	- - -	- - -	- - -	- - -
4	- - -	- - -	- - -	- - -	- - -
5	- - -	- - -	- - -	- - -	- - -
6	- - -	- - -	- - -	- - -	- - -
7	- - -	- - -	- - -	- - -	- - -
8	- - -	- - -	- - -	- - -	- - -
9	- - -	- - -	- - -	- - -	- - -
10	- - -	- - -	- - -	- - -	- - -
11	- - -	- - -	- - -	- - -	- - -
12	- - -	- - -	- - -	- - -	- - -
13	- - -	- - -	- - -	- - -	- - -
14	- - -	- - -	- - -	- - -	- - -
15	- - -	- - -	- - -	- - -	- - -
16	- - -	- - -	- - -	- - -	- - -
17					
18	11.3	1745	13.9	500	8.7
19	10.1	1215	11.3	515	8.9
20	9.3	1215	10.7	2345	7.9
21	7.8	1630	10.2	645	6.4
22	7.1	1630	9.9	545	5
23	6.3	1815	7.8	630	5.1
24	7.3	1745	9.8	415	5.2
25	8.1	1415	9.8	500	6.2
26	9.2	1330	12.1	400	6.4
27	10.1	1500	13.8	515	7
28	10.5	1515	14.2	500	7.3
29	10.1	1445	13.1	515	7.8
30	10.2	1500	13.7	500	7.7
31	10.6	1430	12.9	515	8.5

AVERAGE	9.1	11.7	7.0
MAXIMUM	11.3	14.2	8.9
MINIMUM	6.3	7.8	5.0

ARCTIC NATIONAL WILDLIFE REFUGE

Tamayariak River, Middle Fork

AUGUST 1988

DATE	AVE.WATER	TIME	MAX	TIME	MIN
	TEMP DEG.C	OF MAX.T	TEMP DEG.C	OF MIN.T	TEMP DEG.C
1	9.5	1030	10.5	2345	8.1
2	9.8	1515	12.9	500	7.5
3	8.6	0	10	2345	6.8
4	8.1	1415	10.9	445	6
5	8.2	1745	11.5	545	5.4
6	7.8	1615	10.4	630	5.9
7	7.3	1800	9.6	800	6.1
8	5.9	0	7.2	900	5.1
9	6.8	1730	9.8	545	4.4
10	8.2	1645	11.5	615	5.2
11	8.6	1630	10.8	615	6.6
12	7.3	0	9.1	2345	6
13	7.4	1715	10	600	5.3
14	8.8	1630	12.1	600	5.9
15	9.7	1700	10.7	630	8.8
16	9.3	1745	10.8	600	8
17	10.4	1615	13	630	7.8
18	9.1	0	10.9	2345	6.9
19	6.2	1500	7.8	2345	4.6
20	4.6	1615	6	545	3.5
21	5.9	1730	8.3	445	4.1
22	4.9	0	6.5	2345	4.1
23	4.3	1600	5.6	830	3
24	4.9	1645	6.8	715	3.5
25	4.2	1645	5.1	2345	3.4
26	3.6	1845	4.4	415	3
27	3.7	1645	4.8	645	2.9
28	3.4	1630	4.6	615	2.4
29	2.7	1430	3.3	2345	1.4
30	1.4	1545	2.5	630	0.4
31	1.4	1645	2.8	600	0.4
AVERAGE	6.5		8.4		4.9
MAXIMUM	10.4		13.0		8.8
MINIMUM	1.4		2.5		0.4

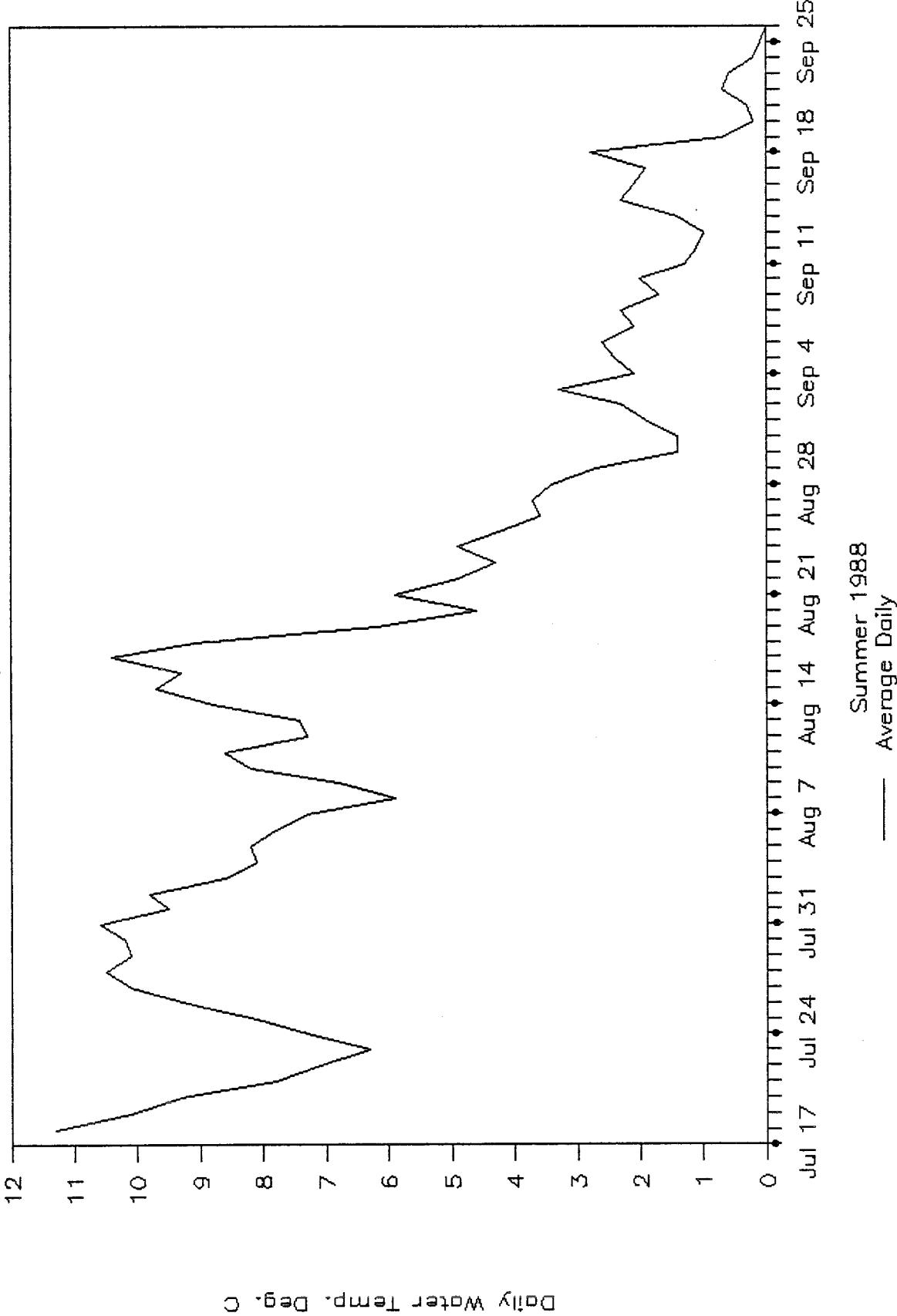
ARCTIC NATIONAL WILDLIFE REFUGE

Tamayariak River, Middle Fork

SEPTEMBER 1988

DATE	AVE.WATER TEMP DEG.C	TIME OF MAX.T	MAX TEMP DEG.C	TIME OF MIN.T	MIN TEMP DEG.C
1	1.9	1500	3.7	615	0.7
2	2.3	1645	5.1	530	0
3	3.3	1645	6.1	615	0.8
4	2.1	0	3.2	2345	1.7
5	2.4	1600	3.6	700	1.3
6	2.6	1700	3.3	2345	2
7	2.1	1615	3.7	800	0.9
8	2.3	1700	4.9	700	0.1
9	1.7	1630	3	730	0.3
10	2	1645	3.5	730	0.7
11	1.3	0	2	945	0.8
12	1.1	1600	2.1	700	0.5
13	1	1630	2.7	600	0
14	1.4	1645	4	145	0
15	2.3	1500	4.2	345	0.6
16	2.1	1615	4.2	745	0.5
17	1.9	1700	4.4	515	0
18	2.8	1545	4.7	645	1.6
19	0.7	0	2	2345	0.3
20	0.2	1545	0.7	515	0
21	0.3	1645	1.1	0	0
22	0.7	630	1.8	130	0
23	0.6	1515	1.9	630	0
24	0.2	1600	0.9	2345	0
25	0.1	1400	0.8	1900	0
26	0	1545	0.3	2015	0
27	- - -	- - -	- - -	- - -	- - -
28	- - -	- - -	- - -	- - -	- - -
29	- - -	- - -	- - -	- - -	- - -
30	- - -	- - -	- - -	- - -	- - -
AVERAGE	1.5		3.0		0.5
MAXIMUM	3.3		6.1		2.0
MINIMUM	0.0		0.3		0.0

Middle Fork Tamayariak River
Water Temperature Readings



ARCTIC NATIONAL WILDLIFE REFUGE

Tamayariak River, Lower West Fork

Location: Lat $69^{\circ} 58'50''$, Long $145^{\circ} 47'40''$, NW1/4NW1/4 sec 12, T.7N., R.25E., 1.5 miles upstream from the confluence with the Tamayariak River, 54 miles west-southwest of Kaktovik, Alaska.

Drainage Area: 98.1 mi², of which 5.6 mi² are located within the Arctic National Wildlife Refuge Wilderness Area.

Remarks: Temperatures were recorded at 15 minute intervals.

Extremes: Maximum Temperature 12.2 °C, July 18, 1988; Minimum Temperature 0 °C, September 24-26, 1988.

JULY 1988

DATE	AVE.WATER	TIME	MAX	TIME	MIN
	TEMP DEG.C	OF MAX.T	TEMP DEG.C	OF MIN.T	TEMP DEG.C
1	- - -	- - -	- - -	- - -	- - -
2	- - -	- - -	- - -	- - -	- - -
3	- - -	- - -	- - -	- - -	- - -
4	- - -	- - -	- - -	- - -	- - -
5	- - -	- - -	- - -	- - -	- - -
6	- - -	- - -	- - -	- - -	- - -
7	- - -	- - -	- - -	- - -	- - -
8	- - -	- - -	- - -	- - -	- - -
9	- - -	- - -	- - -	- - -	- - -
10	- - -	- - -	- - -	- - -	- - -
11	- - -	- - -	- - -	- - -	- - -
12	- - -	- - -	- - -	- - -	- - -
13	- - -	- - -	- - -	- - -	- - -
14	- - -	- - -	- - -	- - -	- - -
15	- - -	- - -	- - -	- - -	- - -
16	- - -	- - -	- - -	- - -	- - -
17	9.2	1815	10.3	2345	8.3
18	9.9	1630	12.2	415	7.5
19	8.8	1200	9.9	445	7.7
20	8.1	1215	9.4	2345	6.8
21	6.8	1630	8.9	615	5.6
22	6.2	1700	8.6	530	4.5
23	5.6	1815	6.8	630	4.5
24	6.3	1730	8.3	415	4.5
25	6.9	1400	8.4	515	5.3
26	7.8	1630	10.1	345	5.4
27	8.6	1415	11.4	515	6.1
28	9.1	1515	12	430	6.4
29	8.7	1630	11	530	6.8
30	9	1430	11.9	400	6.9
31	9.5	1600	11.2	500	7.9

AVERAGE	8.0	10.0	6.3
MAXIMUM	9.9	12.2	8.3
MINIMUM	5.6	6.8	4.5

ARCTIC NATIONAL WILDLIFE REFUGE

Tamayariak River, Lower West Fork

AUGUST 1988

DATE	AVE.WATER	TIME	MAX	TIME	MIN
	TEMP DEG.C	OF MAX.T	TEMP DEG.C	OF MIN.T	TEMP DEG.C
1	8.7	1030	9.5	2345	7.2
2	8.9	1415	11.4	430	6.7
3	7.9	30	9.3	2345	6.1
4	7.1	1330	9.4	430	5.4
5	7.6	1600	10.4	515	5.2
6	8.7	1615	12.1	445	5.7
7	8.8	1445	10.9	2345	6.5
8	6	1715	6.7	630	5.1
9	7	1700	9.6	330	5
10	7.6	1615	10.6	530	4.9
11	7.7	1515	9.7	500	5.9
12	6.7	0	8.1	2345	5.7
13	6.9	1630	9.2	530	5.2
14	8.1	1615	11.2	530	5.4
15	8.7	1615	9.7	530	7.8
16	8.6	1645	10.2	500	7.3
17	9.4	1445	12	615	7.1
18	8.1	0	9.5	2345	6.2
19	5.8	1500	7.3	2345	4.2
20	4.3	1530	5.6	515	3.4
21	5.5	1600	7.7	245	3.9
22	4.7	0	5.4	2345	4.2
23	4.5	1530	5.9	700	3.3
24	4.9	1630	6.5	630	3.6
25	3.9	1545	4.8	2345	2.9
26	3.3	1830	4.1	245	2.7
27	3.5	1600	4.4	2345	2.6
28	3.1	1545	4.1	545	2.2
29	2.5	1430	3.1	2345	1.3
30	1.6	1530	2.6	530	0.7
31	1.6	1645	2.7	530	0.8
AVERAGE	6.2		7.9		4.7
MAXIMUM	9.4		12.1		7.8
MINIMUM	1.6		2.6		0.7

ARCTIC NATIONAL WILDLIFE REFUGE

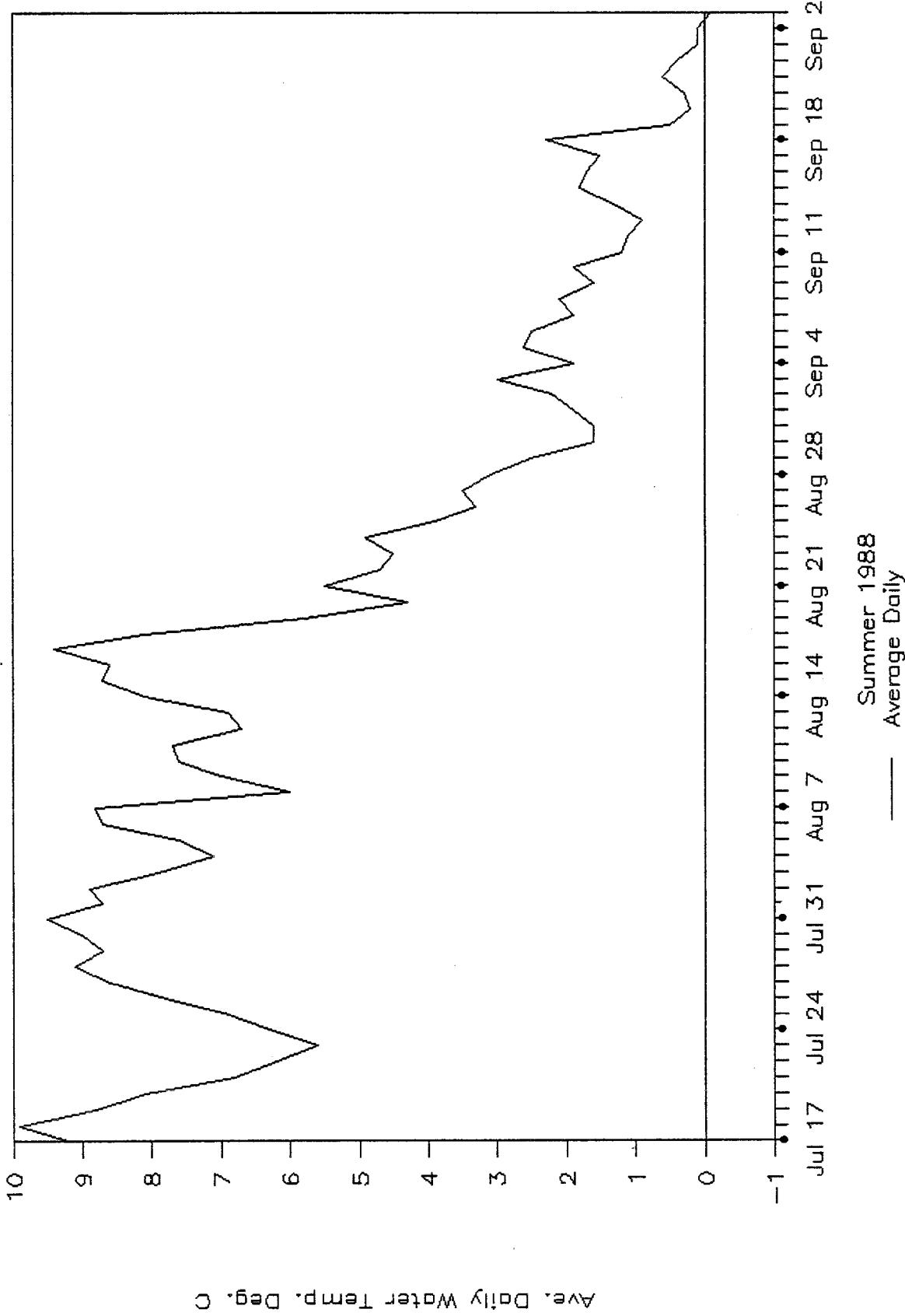
Tamayariak River, Lower West Fork

SEPTEMBER 1988

DATE	AVE.WATER	TIME	MAX	TIME	MIN
	TEMP DEG.C	OF MAX.T	TEMP DEG.C	OF MIN.T	TEMP DEG.C
1	1.9	1500	3.3	545	0.8
2	2.2	1615	4.7	445	0.2
3	3	1600	5.7	545	0.9
4	1.9	0	2.4	545	1.5
5	2.6	1630	3.6	315	1.7
6	2.5	1600	3.2	2345	1.8
7	1.9	1545	3.2	630	0.9
8	2.1	1630	4.4	700	0.4
9	1.6	1500	2.8	645	0.5
10	1.9	1515	3.3	715	0.9
11	1.2	0	1.6	2345	0.8
12	1.1	1500	1.9	2345	0.5
13	0.9	1545	2.4	630	0.1
14	1.3	1630	3.5	330	-0.1
15	1.8	1515	3.6	330	0.4
16	1.7	1600	3.5	745	0.3
17	1.5	1615	3.8	600	-0.1
18	2.3	1545	3.8	45	1.2
19	0.5	0	1.5	815	0.2
20	0.2	1430	0.6	530	-0.1
21	0.3	1615	1.1	515	-0.1
22	0.6	1530	1.7	515	-0.1
23	0.4	1515	1.5	615	-0.1
24	0.1	1600	0.6	2215	-0.1
25	0.1	1545	0.8	115	-0.1
26	-0.1	1545	0.2	1815	-0.1
27	- - -	- - -	- - -	- - -	- - -
28	- - -	- - -	- - -	- - -	- - -
29	- - -	- - -	- - -	- - -	- - -
30	- - -	- - -	- - -	- - -	- - -
AVERAGE	1.4		2.6		0.5
MAXIMUM	3.0		5.7		1.8
MINIMUM	-0.1		0.2		-0.1

Lower West Fork Tamayariak River

Water Temperature Readings



Ave. Daily Water Temp. Deg. C

ARCTIC NATIONAL WILDLIFE REFUGE

Tamayariak River, Upper West Fork

Location: Lat $69^{\circ} 49' 58''$, Long $145^{\circ} 55' 15''$, in the center W1/2W1/2 sec 33, T.6N., R.25E., 13.9 miles upstream from the confluence with the Tamayariak River, 61.1 miles west-southwest of Kaktovik, Alaska.

Drainage Area: 49.2 mi², of which 5.6 mi² are located within the Arctic National Wildlife Refuge Wilderness Area.

Remarks: Temperatures were recorded at 15 minute intervals.

Extremes: Maximum Temperature 15 °c, Aug. 6, 1988; Minimum Temperature 0 °c, September 24-26, 1988.

JULY 1988

DATE	TEMP	TIME	MAX	TIME	TEMP
	DEG.C	OF	TEMP	OF	DEG.C
	Avg	Max.T	deg.c	Min.T	Min
1	- - -	- - -	- - -	- - -	- - -
2	- - -	- - -	- - -	- - -	- - -
3	- - -	- - -	- - -	- - -	- - -
4	- - -	- - -	- - -	- - -	- - -
5	- - -	- - -	- - -	- - -	- - -
6	- - -	- - -	- - -	- - -	- - -
7	- - -	- - -	- - -	- - -	- - -
8	- - -	- - -	- - -	- - -	- - -
9	- - -	- - -	- - -	- - -	- - -
10	- - -	- - -	- - -	- - -	- - -
11	- - -	- - -	- - -	- - -	- - -
12	- - -	- - -	- - -	- - -	- - -
13	- - -	- - -	- - -	- - -	- - -
14	- - -	- - -	- - -	- - -	- - -
15	- - -	- - -	- - -	- - -	- - -
16	- - -	- - -	- - -	- - -	- - -
17	- - -	- - -	- - -	- - -	- - -
18	11.8	1615	13.5	500	9.5
19	11.3	1745	12.2	2345	10.4
20	10	1445	11	2345	8.6
21	8	1345	9.7	2345	6.8
22	7.3	1645	9.2	615	5.7
23	8.3	1630	10.7	530	6.3
24	8.8	1715	11.1	515	7.2
25	10.1	1330	11.9	445	8.5
26	10.6	1330	12.8	445	8.3
27	11.2	1445	13.6	530	8.6
28	12.1	1415	14.9	415	9.4
29	12.1	1345	14.3	445	9.8
30	12.1	1415	14.3	315	10.5
31	11.5	645	12.3	2345	10.6

AVERAGE	10.4	12.3	8.6
MAXIMUM	12.1	14.9	10.6
MINIMUM	7.3	9.2	5.7

ARCTIC NATIONAL WILDLIFE REFUGE

Tamayariak River, Upper West Fork

AUGUST 1988

DATE	AVE.WATER	TIME	MAX	TIME	MIN
	TEMP DEG.C	OF MAX	TEMP DEG.C	OF MIN	TEMP DEG.C
1	10.7	1430	12	2345	9.7
2	11.3	1415	14.3	415	9.1
3	10	0	11.2	2345	8.2
4	9.1	1415	11.6	615	6.9
5	9.9	1600	13.2	500	6.5
6	11.9	1615	15	430	9.2
7	12.5	1445	14.9	2345	9.3
8	6.4	0	9.2	2345	4.9
9	6.3	1815	9.2	530	4.1
10	8.2	1715	11.7	545	4.7
11	9.4	1700	11.2	500	7.7
12	7.4	0	9.8	2345	5.4
13	7.2	1800	10.2	545	4.8
14	9.2	1630	12.2	545	6.2
15	10.6	1515	11.6	615	9.6
16	10.1	1715	11.7	600	8.7
17	11.7	1700	14.2	615	8.7
18	10.6	0	12.2	2345	8.2
19	6.9	0	8.1	2345	5.8
20	5.8	1630	7.6	645	4.4
21	7.4	1715	9.3	500	5.9
22	5.7	0	7.5	2345	4.5
23	4.5	1500	5.7	630	3.2
24	4.7	1545	6.6	600	3.3
25	5.2	1630	7.4	645	3.8
26	4.8	1845	5.9	600	3.8
27	5	1700	6.4	700	4
28	4.6	1630	6	630	3.5
29	3.5	0	4.4	2345	1.8
30	1.6	1545	3	2345	0.6
31	1.3	1600	3.1	445	0
AVERAGE	7.5		9.6		5.7
MAXIMUM	12.5		15.0		9.7
MINIMUM	1.3		3.0		0.0

ARCTIC NATIONAL WILDLIFE REFUGE

Tamayariak River, Upper West Fork

SEPTEMBER 1988

DATE	AVE. WATER	TIME	MAX	TIME	MIN
	TEMP DEG.C	OF MAX	TEMP DEG.C	OF MIN	TEMP DEG.C
1	1.8	1615	3.8	630	0.3
2	2.2	1630	4.9	400	0
3	3.6	1630	6.8	600	0.8
4	2	0	3.5	2345	1.5
5	2.2	1645	3.4	600	1.1
6	2.8	1800	3.6	800	2.2
7	2.8	1515	4.5	715	1.6
8	2.9	1645	6	715	0.2
9	2.4	1645	4.2	730	0.5
10	2.2	1515	4.5	715	0
11	1.6	1700	2.7	2345	0.8
12	0.9	1545	2.1	645	0.3
13	0.9	1545	2.9	300	0
14	1.3	1600	3.7	600	0
15	2	1415	4.1	400	0.1
16	2.3	1545	4.5	730	0.4
17	2	1645	4.7	445	0
18	2.9	1545	5	700	1.5
19	0.8	0	2.1	900	0.5
20	0.2	1545	0.8	2130	0
21	0.4	1615	1.4	130	0
22	0.3	1615	1.3	130	0
23	0.4	1430	1.7	2100	0
24	0	1615	0.4	1930	0
25	0	1615	0.3	1845	0
26	0	1230	0.1	1700	0
27	- - -	- - -	- - -	- - -	- - -
28	- - -	- - -	- - -	- - -	- - -
29	- - -	- - -	- - -	- - -	- - -
30	- - -	- - -	- - -	- - -	- - -

AVERAGE	1.6	3.2	0.5
MAXIMUM	3.6	6.8	2.2
MINIMUM	0.0	0.1	0.0

Upper West Fork of the Tamayariak River

Water Temperature Readings

